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Coal Combustion Waste Impoundment

Round 7 - Dam Assessment Report

Walter Scott Junior Energy Center

(Site # 14)

MidAmerican Energy

Council Bluffs, Iowa

Prepared for:

United States Environmental Protection Agency
Office of Resource Conservation and Recovery

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INTRODUCTION, SUMMARY, CONCLUSION AND RECOMMENDATIONS

The release of over five million cubic yards of coal ash from the Tennessee Valley Authority's Kingston, Tennessee facility in December 2008, which flooded more than 300 acres of land, damaging homes and property, is a wake-up call for diligence on coal combustion waste disposal units. A first step to prevent such catastrophic failure and damage is to assess the stability and functionality of ash impoundments and other units, then quickly take any needed corrective measures.

This assessment of the stability and functionality of the MidAmerican Energy Company (MEC) coal combustion waste (CCW) management units is based on a review of available documents and on the site assessment conducted by Dewberry personnel on September 15, 2010. We found the supporting technical information to be generally adequate (Section 1.1.3). As detailed in Section 1.2 there are some recommendations that may help to maintain a safe and trouble-free operation.

In summary, the MidAmerican Walter Scott Junior Energy Center North Surface Impoundment (North Ash Pond) is currently rated **FAIR** and the South Surface Impoundment (South Ash Pond) is currently rated **FAIR** for continued safe and reliable operation. The presence of a slough on the outside slope of the dike embankment (levee) on the north side of the South Ash Pond and the need for documentation of safety of the impounding embankments of both ponds under certain modes of potential failure strongly influences the ratings of these units. Although the slough does not immediately threaten a breach of the dike, it is a deficiency that needs to be corrected as soon as conditions permit. Repair of the slough is the responsibility of the US Army Corp of Engineers (USACE), as this dike is part of a levee system protecting against flood water in the adjacent Pony Creek. MidAmerican has indicated that the USACE has instructed MidAmerican not to do any kind of repairs at the slough, as the USACE plans to repair the dike when water levels in Pony Creek are lower. The other issues are documentation deficiencies at this time.

PURPOSE AND SCOPE

The U. S. Environmental Protection Agency (EPA) is embarking on an initiative to investigate the potential for catastrophic failure of Coal Combustion Surface Impoundments (i.e. management units) from occurring at electric utilities in an effort to protect lives and property from the consequences of a dam failure or the improper release of impoundment contents. The EPA initiative is intended to identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures (if present); to note the extent of deterioration (if present); status of maintenance and/or a need for immediate repair; to evaluate conformity with current design and construction practices, and to determine the hazard potential classification for units not currently classified by the management unit owner or by a state or federal agency. The initiative will address management units that are classified as Less-than-Low, Low, Significant or High Hazard Potential ranking. (For Classification, see pp. 3-8 of the 2004 Federal Guidelines for Dam Safety.)

In March 2009, the EPA sent letters to coal-fired electric utilities seeking information on the safety of surface impoundments and similar facilities that receive liquid-borne material that store or dispose of coal combustion waste. This letter was issued under the authority of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 104(e), to assist the Agency in assessing the structural stability and functionality of such management units, including which facilities should be visited to perform a safety assessment of the berms, dikes, and dams used in the construction of these impoundments.

EPA asked utility companies to identify all management units, such as surface impoundments or similar diked or bermed structures and landfills receiving liquid-borne materials, that store or dispose of coal-combustion residuals or by-products, including, but not limited to, fly ash, bottom ash, boiler slag, and flue gas emission control residuals. Utility companies responded with information on the size, design, age, and the amount of material placed in the units so that EPA could gauge which management units had or potentially could rank as having High Hazard Potential. The USEPA and its contractors used the following definitions for this study:

> "Surface Impoundment or impoundment means a facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold an accumulation of liquid wastes or wastes containing free liquids, and which is not an injection well. Examples of surface impoundments are holding, storage, settling and aeration pits, ponds, and lagoons."
>
> For this study, the earthen materials could include coal combustion residuals. EPA did not provide an exclusion for small units based on whether the placement was temporary or permanent. Furthermore, the study covers not only waste units designated as surface impoundments, but also other units designated as landfills which receive free liquids.
>
> EPA is addressing any land-based units that receive fly ash, bottom ash, boiler slag, or flue gas emission control wastes along with free liquids. If the landfill is receiving coal combustion wastes with liquids limited to that for proper compaction, then there should not be free liquids present and the EPA did not seek information on such units which are appropriately designated a landfill.
>
> In some cases coal combustion wastes are separated from the water, and the water containing de minimus levels of fly ash, bottom ash, boiler slag, or flue gas emission control wastes are sent to an impoundment. EPA is including such impoundments in this

study, because chemicals of concern may have leached from the solid coal combustion wastes into the waster waters, and the suspended solids from the coal combustion wastes remain.

The purpose of this report is to evaluate the condition and potential of waste release from **management units that have not been rated for hazard potential classification**. A two-person team reviewed the information submitted to EPA, reviewed any relevant publicly available information from state or federal agencies regarding the unit potential hazard classification (if any) and accepted information provided via telephone communication with a management unit representative.

This evaluation included a site visit. EPA sent two engineers, one licensed in the State of Iowa, for a one-day visit. The two-person team met with the technical and management representatives of the management unit(s) to discuss the engineering characteristics of the unit as part of the site visit. During the site visit the team collected additional information about the management unit(s) to be used in determining the hazard potential classifications of the management unit(s). Subsequent to the site visit the management unit owner provided additional engineering data pertaining to the management unit(s).

Factors considered in determining the hazard potential classification of the management unit(s) included the age and size of the impoundment, the quantity of coal combustion residuals or by-products that were stored or disposed in the these impoundments, its past operating history, and its geographic location relative to down gradient population centers and/or sensitive environmental systems.

This report presents the opinion of the assessment team as to the potential of catastrophic failure and reports on the condition of the management unit(s). The team considered criteria in evaluating the dams under the National Inventory of Dams in making these determinations. (Note: The terms “dike” and “dam” are used interchangeably in this report, as are the terms “pond” and “basin.” The term “levee” is used to mean a dike used for flood protection.)

LIMITATIONS

The assessment of dam safety reported herein is based on field observations and review of readily available information provided by the owner/operator of the subject coal combustion waste management unit(s). Qualified Dewberry engineering personnel performed the field observations and review and made the assessment in conformance with the required scope of work and in accordance with reasonable and acceptable engineering practices. No other warranty, either written or implied, is made with regard to our assessment of dam safety.

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1.0 CONCLUSIONS AND RECOMMENDATIONS

1.1 CONCLUSIONS

Conclusions are based on visual observations from the one-day site visit and review of technical and historical documentation provided by MidAmerican (Appendix C). Field observations are documented with photographs in Appendix A and checklists in Appendix B. (Note: Some information on the checklists was based on field estimates and limited review of available data at the time of the site visit and thus may not be entirely consistent with information presented in this report, which is based on a thorough review of all available data, including additional furnished information.) Additional requested information, and miscellaneous information furnished for review are included in Appendices D and E.

1.1.1 Conclusions Regarding the Structural Soundness of the Management Unit(s)

The structural stability of the perimeter dikes impounding the ash ponds appears adequate with respect to global stability under static and seismic (pseudo-static) loading conditions. The slough that was observed on the outside slope of the levee on the north side of the South Ash Pond appears to have been caused by loss of toe support due to erosion during flood flows in Pony Creek and not due to inherent instability of the levee section. The safety of the dike/levee embankments around both ponds with respect to seepage uplift and liquefaction potential is undetermined and thus unknown at this time. The reason for the low dike embankment section on the east side of the South Ash Pond is undetermined and unknown at this time. Additional study or documentation is needed to assess these issues.

Visible parts of the outlet structure at the North Ash Pond appeared to be in sound and stable condition with no visual evidence of significant deterioration, except at the discharge end of the outlet pipe, including end wall and flap gate, which apparently were damaged during straightening/dredging operations in Pony Creek.

From MidAmerican it is understood that the USACE has indicated that fixing various issues in the area of the Pony Creek improvement project, including repair of the discharge end of the outlet pipe and repair of the slough on the outside slope of the levee on the north side of the South Ash Pond, will have started in late October 2010, before issue of this assessment report.

1.1.2 Conclusions Regarding the Hydrologic/Hydraulic Safety of the Management Unit(s)

No hydrologic/hydraulic analyses of the ash ponds were available for review. However, on the basis of simple calculations made for this evaluation, the ash ponds, which are totally contained within perimeter dike systems, are capable of accommodating precipitation depths exceeding the Iowa Department of Natural Resources' design criterion, as well as the U.S. Army Corps of Engineers' (USACE) design criterion for the size and hazard potential classifications assigned to the WSEC ash ponds. The hydrologic safety of the ash ponds is more influenced by the potential for external flooding into the ash ponds rather than overtopping of water impounded within the ponds. The hydrologic safety of the ash ponds is reliant on the flood-protection levees, which are required by the levee districts to provide protection up to the 100-year flood. This is at the lower limit of the USACE criterion for impoundments.

1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

Supporting technical documents are generally adequate for the purposes of this review and assessment, although furnished drawings show original design features and do not reflect as-built features or all modifications that have been made since original construction (e.g., the SIRE railroad embankment built across the western part of the ash basins does not show on any of the furnished drawings).

No documentation of hydrologic/hydraulic analyses was available, but none was needed to make an assessment of the ash ponds' capacity to safely contain design storm precipitation over the basins, which are totally contained within perimeter dike systems. However, MidAmerican should perform its own calculations to provide formal documentation of internal hydrologic safety of the ash basins and update the calculations as necessary to account for changes in internal drainage patterns and reduction in available flood surcharge storage as the basins fill with more ash.

Since the ash ponds rely upon the flood-protection levees, particularly those along Pony Creek, which are the critical impounding dikes for both ash ponds, copies of current documentation of structural stability and current hydrologic analyses that pertain to the flood-protection levees should be obtained and maintained in MidAmerican files. The responsibility for conducting the analyses may lie with the levee districts and/or the USACE. In addition, MidAmerican should conduct under-seepage analyses and liquefaction potential analyses if such analyses are not available from the study conducted for the USACE/levee districts or if those analyses will not apply to the other dikes around the ash ponds because conditions are too dissimilar. Also, in the absence of documentation of the reason for the very low dike embankment section on the south part of the perimeter dike on the east side of the South Ash Pond, MidAmerican should conduct a documented investigation of the compressibility of the underlying thick very soft fat clay layer and its effect on the performance of the dike embankment. The effect of design earthquake shaking on the very soft clay layer should also be evaluated.

1.1.4 Conclusions Regarding the Description of the Management Unit(s)

Descriptions provided are generally sufficient. As noted above, furnished drawings do not show or note as-built features or all modifications that have been made since original construction.

1.1.5 Conclusions Regarding the Field Observations

The dike embankments around both ash ponds appeared to be structurally sound with no evidence of significant seepage. There were no apparent indications of serious conditions that immediately threaten the safety of the impounding dikes.

A slough observed on the outside slope of the dike embankment (levee) on the north side of the South Ash Pond does not immediately threaten the safety of the ash pond, but it should be repaired as soon as conditions permit; it is understood that the USACE has plans to do so. Otherwise, the visible parts of the dike embankments were observed to have no signs of overstress, significant recent settlement, shear failure, or other signs of instability, although visual observations of the embankment slopes in some areas were hampered by the presence of a tall growth of sunflowers and weeds.

The crest of the dike embankment on the east side of the South Ash Pond was observed to be much lower, by 6.3 feet, than called for by design and to have an undulating surface. The departure from the design elevation seems too great to be the result of settlement, since the embankment is relatively low, only 10 feet thick according to a recent boring made by Terracon on this section of the dike. However, the boring also penetrated a layer of very soft dark gray fat clay more than 25 feet thick in the lower part of the foundation soil profile below a depth of 23.5 feet. Nevertheless, settlement on the order of 6.3 feet under the weight of a 10-foot thick embankment seems unlikely, although some settlement probably occurred. The embankment apparently was constructed low for reasons currently unknown; possibly the embankment was constructed low to keep the embankment toe off the I-29 right-of-way or to keep the dike embankment lower than the I-29 embankment. The high points along the undulating crest appeared to occur at the locations of power poles that are in pairs on the inside slope along the length of the embankment; possibly the surface was built up just prior to power pole installation to provide minimum embedment depths for the poles.

The visible part of the only outlet structure, located at the North Ash Pond, was observed to be in sound, stable condition, except at the discharge end, where the last section with attached end wall and flap gate had been detached, apparently by straightening/dredging operations during a USACE improvement project in Pony Creek. The damaged end of the outlet structure should be repaired to restore the structure to serviceable condition.

1.1.6 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

Methods of operation are adequate. Maintenance is generally adequate. There was no evidence of repaired embankment breaches or prior releases observed during the field assessment. There are several maintenance issues that should be addressed, as discussed in Subsection 8.3.2, Adequacy of Maintenance, and recommended in Subsection 1.2.6, Recommendations Regarding the Maintenance and Methods of Operation.

1.1.7 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

The inspection program is substandard. A formal inspection program should be developed and implemented as discussed in Subsection 9.3.1, Adequacy of Inspection Program, and recommended in Subsection 1.2.7, Recommendations Regarding the Surveillance and Monitoring Program. There is no dam monitoring program in place that includes such instruments as observation wells/piezometers, settlement monitoring points, inclinometers, seepage monitoring points, etc. Such monitoring instruments do not appear to be warranted for these low dikes at this time. A program of groundwater quality monitoring and North Ash Pond discharge monitoring is in place and will continue in accordance with IA DNR permit requirements.

1.1.8 Classification Regarding Suitability for Continued Safe and Reliable Operation

North Ash Pond – In accordance with EPA criteria the North Ash Pond is rated FAIR for continued safe and reliable operation. This rating is influenced by the need for documentation of safety against seepage uplift and liquefaction potential; this documentation would help improve the rating. It is noted that the discharge end of the outlet structure needs to be repaired to ensure continued serviceable operation. However, the hydrologic safety of the North Ash Pond during large flooding events is not reliant on discharge through the outlet structure; in fact during flood stages in Pony Creek, discharge through the outlet structure is not possible. The hydrologic safety of the North Ash Pond is reliant on its very large flood storage capacity and catchment area equal to the area of the ash basin.

South Ash Pond – In accordance with EPA criteria the South Ash Pond is rated FAIR for continued safe and reliable operation. This rating is influenced by the need to repair the slough on the outside slope of the dike that forms the north side of the South Ash Pond, and the need for documentation of safety against seepage uplift and liquefaction potential, as well as documentation/study of the reason for the low crest of the dike embankment on the east side of the pond. Satisfactory completion of repair to the sloughed area by the USACE and documentation of the safety of the dike for the above-noted issues would help improve the rating.

1.2 RECOMMENDATIONS

1.2.1 Recommendations Regarding the Structural Stability

None appear warranted at this time, other than to maintain current documentation of stability analyses of the impounding levees/dikes of both ash ponds under all credible modes of potential failure as recommended in Subsection 1.2.3.

1.2.2 Recommendations Regarding the Hydrologic/Hydraulic Safety

None appear warranted at this time, other than to maintain current documentation of hydrologic analyses of both ash ponds as recommended in Subsection 1.2.3.

1.2.3 Recommendations Regarding the Supporting Technical Documentation

Maintain current documentation of all relevant appropriate stability analyses and hydrologic analyses in MidAmerican files, including copies of the current analyses conducted under the charge of the levee districts and/or the USACE. The utility should ask the levee districts and the USACE for updates of the analyses whenever they are made.

Perform hydrologic calculations to provide formal documentation of internal hydrologic safety of the ash basins and update the calculations as necessary to account for changes in internal drainage patterns and reduction in available flood surcharge storage as the basins fill with more ash.

If analyses conducted under the charge of the levee districts and/or the USACE are not available or will not adequately apply to the dikes under MidAmerican's charge, conduct underseepage analyses and liquefaction potential analyses for the impounding dikes of both ash ponds, as appropriate; it is noted that underseepage analysis of the South Ash Pond dike may not be necessary if further field exploration shows that the thick fat clay foundation layer is present all along the dike embankment sections under MidAmerican's charge. However, unless documentation is uncovered of the reason for the very low dike embankment section on the south part of the perimeter dike on the east side of the South Ash

Pond, conduct a documented investigation of the compressibility of the underlying thick very soft fat clay layer and its effect on the performance of the dike embankment where the dike is unusually low; in addition, evaluate the effect of design earthquake shaking on the very soft clay layer.

1.2.4 Recommendations Regarding the Description of the Management Unit(s)

Update project documents to include or note current features of the ash basins and modify or supplement the documents as needed when changes are made in the future. For example, the recently completed crest elevation profiles around both ash ponds surveyed by HGM Associates, Inc. (Appendix D - Item 2) serves to provide documentation of current crest elevations, which should be referenced on official project plans.

1.2.5 Recommendations Regarding the Field Observations

A number of field observations relate to maintenance issues. Recommendations regarding maintenance issues are included in the following Subsection 1.2.6.

Two field observations relate to repair issues. One concerns the slough on the outside slope of the dike on the north side of the South Ash Pond. Although MidAmerican does not have responsibility for repairing the slough, it is recommended that MidAmerican continue to closely monitor the slough for any worsening conditions, particularly during and after rainstorms, and have a contingency plan for taking quick action, on its own if necessary, should conditions rapidly deteriorate at the slough. Apprise the USACE of any deterioration at the slough.

The other repair issue concerns the detached end section with end wall and flap gate at the discharge end of the outlet pipe through the levee on the south side of the North Ash Pond. Repair of this end section also appears to be the responsibility of the USACE. Although not as critical as the slough, the end section should be repaired as soon as possible. Without the flap gate water could enter the pipe during flood stages in Pony Creek and place the pipe section through the levee under pressure, which is a condition the pipe likely does not normally experience. (Furnished drawings of the outlet structure do not indicate whether or not the pipe joints were to have O-ring seals.) It is recommended that discharges through the outlet pipe be limited as much as possible until the end section can be repaired. It is further recommended that MidAmerican monitor conditions at the damaged end of the outlet pipe to check for erosion and undermining.

Recommendations for an investigation regarding the very low dike embankment crest elevation observed on the south part of the perimeter dike on the east side of the South Ash Pond are included above in Subsection 1.2.3; raising this low section of dike does not appear to be necessary at this time, but may need to be considered if the investigation shows continuing settlement due to unusually large secondary compression effects or if more formal calculations of hydrologic safety show a need for more freeboard at the low dike section.

1.2.6 Recommendations Regarding the Maintenance and Methods of Operation

No recommendations appear to be warranted at this time with respect to methods of operation.

Maintenance recommendations are as follows:

- Eradicate sunflowers and other tall, stalky vegetation on the dike embankment slopes or control this type of vegetation by cutting three times during the growing season. Continue to mow the crests and shoulder areas of the dike embankments, also three times during the growing season.
- If possible through an agreement with the adjacent land owner, remove the small trees and bushes on the outside slope of the dike on the north side of the North Ash Pond before they become large.
- Place riprap protection on the eroded inside slope of the North Ash Pond along the waterline on the east side near north end, when planned riprap repairs at the South Ash Pond are done.
- Clean sediment out of the overflow structure at the inlet end of the outlet structure in the North Ash Pond and maintain the structure clear of sediment in the future, to assure that the opening under the skimmer wall is not blocked.

1.2.7 Recommendations Regarding the Surveillance and Monitoring Program

Develop and implement a formal inspection program that includes at a minimum the following:

- Quarterly inspections performed by plant operating personnel familiar with the dike embankments and trained on what to look for in the field. The quarterly inspections should be documented; use of a checklist form is suggested.
- Annual inspections performed by an engineer familiar with the dike embankments and associated engineering data. The annual inspections should be documented with a written inspection report, or checklist form, including evaluation and recommendations.
- Internal inspections of the outlet structure conducted every 5 years with a remote camera or by personnel using confined-space entry procedures. The results should be documented with a written inspection report.

During future inspections, closely observe the dike embankment on the north side of the North Ash Pond where the inside slope is particularly steep just above waterline, to check for tension cracks, slide scarps or other signs of mass soil movement.

No recommendations for permanent performance monitoring instruments appear to be warranted at this time. However, frequent visual monitoring of the temporary steel pins behind the slough on the outside slope of the dike on the north side of the South Ash Pond should continue as planned and frequent visual monitoring of the damaged end of the outlet pipe should be done, until both are repaired by the USACE.

1.2.8 Recommendations Regarding Continued Safe and Reliable Operation

No additional recommendations for continued safe and reliable operation appear to be warranted at this time. However, it would be prudent to periodically review changes in the structures and activities around the ash ponds that may alter the hazard potential classification or assessment of the consequences of failure of the perimeter dikes.

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1.3 PARTICIPANTS AND ACKNOWLEDGEMENT

1.3.1 List of Participants

*Fred Tucker, Dewberry
*Mark Hoskins, Dewberry
*Matt Finnegan, MidAmerican
*David P. Maystick, MidAmerican
Mark Podany, MidAmerican
*Jennifer McIvor, MidAmerican
*Jeff Walters, MidAmerican

*Participated in dike field observations

1.3.2 Acknowledgement and Signature

We acknowledge that the Walter Scott Junior Energy Center management units referenced herein were assessed on September 15, 2010.

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2.0 DESCRIPTION OF THE COAL COMBUSTION WASTE MANAGEMENT UNIT(S)

2.1 LOCATION AND GENERAL DESCRIPTION

The Walter Scott Junior Energy Center (WSEC) is physically located between the Missouri River and Interstate 29, south of the Lake Manawa in Pottawattamie County, Iowa, approximately 2 miles northeast of Bellevue, Nebraska. Mosquito Creek runs from the north through WSEC, between the plant and the North Surface Impoundment, to the Missouri River. Pony Creek runs between the North Surface Impoundment and the South Surface Impoundment from the east to the Missouri River. The WSEC is located on Navajo Street, Council Bluffs, Iowa 51501. The Missouri River is west of WSEC, and Interstate 29 is to the east. See Appendix C - Doc 1.1 for location of the WSEC on an aerial map.

WSEC has two impoundments designated for storage and disposal of coal combustion waste (CCW), including:

- North Surface Impoundment
- South Surface Impoundment

The two basins used for managing coal combustion waste (CCW) and are designated as North Surface Impoundment (North Ash Pond also known as Ash Pond 2) and South Surface Impoundment (South Ash Pond also known as Ash Pond 1). The ponds are partially incised and the perimeters are formed by dikes and levees. The levees of Mosquito Creek and Pony Creek form the west and south embankments of the North Ash Pond and the north embankment of the South Ash Pond. Dikes form the east and north embankments of the North Ash Pond and the south, east and west embankments of the South Ash Pond. The power plant is southwest of the North Ash Pond and northeast of the South Ash Pond. The Southwest Iowa Renewable Energy (SIRE) rail line runs north-south on an embankment through the west parts of the North and South Ash Ponds. The ponds were essentially developed from pre existing incised ponds (old borrow pits) adjacent to Interstate 29.

The North Ash Pond is active and currently receives bottom ash and boiler slag from coal-fired units, and mill rejects (pyrite) at the WSEC; it formerly received fly ash. This pond is filled to approximately 40 percent capacity as of March 2009; the storage volume varies due to the excavation of ash for retail. The South Ash Pond receives bottom ash, boiler slag, and pH-adjusted process water from the demineralization system. See Appendix C - Doc 1.2 for relative locations of the ponds on an aerial view map of the WSEC. An outlet structure located through the east part of the levee on the south side of the North Ash Pond discharges into Pony Creek. The North Ash Pond discharge is regulated by the Iowa Department of Natural Resources (IA DNR). There is no outlet from the South Ash Pond; water in the pond is recycled back to the plant and reused. The Levee District of Pottawattamie and Mills County is responsible for the embankments forming the levees of Pony Creek, and the Levee District of City of Council Bluffs is responsible for the embankments forming the levees of Mosquito Creek. The Army Corps of Engineers assists the levee districts in the maintenance and inspection of the levees.

The North Ash Pond is an unlined basin with a total surface area of approximately 171 acres, including ash-filled areas that do not have impounded water and the area of a railroad embankment. This pond is contained by dikes on the north and east sides, the Pony Creek levee on the south side, and the Mosquito Creek levee on the west side. According to a furnished drawing (Appendix C - Doc 1.3), the lowest crest elevation of the embankment of the North Ash Pond is 979.1 feet (Mosquito Creek levee). However, a recently completed survey of the crest elevations around the perimeter of the pond (Appendix D - Item 2) indicates the lowest crest elevation now is 978.8 feet (again on the Mosquito Creek levee). The height of the low point above the immediately adjacent outside toe is indicated to be about 11.2 feet (MEC response to EPA's RFI dated March 30, 2009), but the height above the low point on the outside toe is about 17.9 feet. The crest of the Pony Creek levee on the south side of the North Ash Pond is approximately 3 feet higher than the embankments on the other sides of the basin and is more than 24 feet above the normal water level in Pony Creek. The bottom elevation of the North Ash Pond is approximately 948 feet based on elevation information on the furnished drawing (Appendix C - Doc 1.3), which is 17 to 20 feet below the typical outside toe elevations (965 to 968 feet) around the North Ash Pond.

The South Ash Pond is an unlined basin with a total surface area of approximately 133 acres, including ash-filled areas that do not have impounded water and the area of a railroad embankment. This pond is contained by dikes on the south, east, and west sides. The Pony Creek levee bounds the north side. According to the recent survey (Appendix D - Item 2), the lowest crest elevation of the embankment of the South Ash Pond is 973.8 feet (south part of dike on east side). The height of this low point above the immediately adjacent outside toe is about 6.8 feet (6.6 feet given in MEC response to EPA's RFI dated March 30, 2009), but the height above the low point on the outside toe is about 8.8 feet. The typical crest elevation of the dike, except on the Pony Creek levee, is approximately 980 feet, which is 15 feet above the low point on the outside toe. Approximately 700 feet of the dike at the southeast end of the South Ash Pond, adjacent to I-29, is up to 6 feet or more below the typical crest elevation. The crest of the Pony Creek levee on the north side of the South Ash Pond is about 3 feet higher than the typical crest elevation and is about 24 feet above the normal water level in Pony Creek. The bottom elevation of the South Ash Pond is approximately 961 feet based on elevation information on the furnished drawing (Appendix C - Doc 1.3), which is 5 to 9 feet below the typical outside toe elevations (966 to 970 feet) around the South Ash Pond.

2.2 SIZE AND HAZARD CLASSIFICATION

The WSEC embankments are not regulated by a federal or state agency and currently do not have federal or state hazard potential classifications. The North Ash Pond discharge is regulated by Iowa Department of Natural Resources (IA DNR).

North Ash Pond –The total storage capacity is 3.3 million cubic yards (2,045.5 acre-feet) with a percentage (less than 50 percent) within the incised part of the basin below exterior grades. Other physical data are summarized in Table 2.1. The USACE criteria for Size Classification are presented in Table 2.2. Based on storage capacity, the North Ash Pond dam has an Intermediate Size Classification, although it borders on Small when the incised part of the storage is taken into consideration. The dam currently has an undetermined hazard potential rating. The criteria for Hazard Potential Classification used by the Environmental Protection Agency (EPA) are presented in Table 2.3. For comparison the IA DNR criteria for Dam Hazard Classification are presented in Table 2.4. Failure of the south side levee would discharge water and potentially CCW into Pony Creek. Failure of the west side levee would discharge water into Mosquito Creek. Failure of the east side dike would discharge water and potentially CCW into the Interstate 29 west side swale. Failure of the north side dike would discharge water and potentially CCW onto a farm road and into a drainage ditch and onto adjacent farmland. The above failure scenarios assume basin water levels well above the normal operating range of 962 to 966 feet. A failure occurring when the basin water level is within the normal operating range would release little or no water, depending on location of the failure, since the outside toe elevations range from a little below to a little above the normal operating range. Failure of the levee and dike embankments around the North Ash Pond would not likely cause loss of life but would cause some environmental damage and minor economic damage to the adjacent farm. Therefore, the North Ash Pond dam should be given a Low Potential Hazard Classification per the criteria used by EPA (Table 2.3).

South Ash Pond – The total storage capacity is 2.14 million cubic yards (1,326 acre-feet) with a percentage (less than 50 percent) within the incised part of the basin below exterior grades. Other physical data are summarized in Table 2.1. Based on storage capacity, the South Ash Pond dam is conservatively assigned an Intermediate Size Classification. Although some of the storage is incised below immediately adjacent outside toe grades, the bottom of the basin is still above the normal water level in Pony Creek; thus, there is the potential that a breach through the north side levee could erode down to the basin bottom elevation. The Intermediate Size Classification is considered conservative, since the maximum volume of water that can be stored in the basin is less than 1,000 acre-feet; much of the total storage volume is occupied by bottom ash deposits which are relatively stable and would not be expected to flow like water or slurry, although some of the ash would be eroded and transported with the water. The dam currently has an undetermined hazard potential rating. Failure of the north side levee would discharge water and potentially CCW into Pony Creek. Failure of the east side dike would discharge water and potentially CCW into the Interstate 29 west side swale. Failure of the south side dike would discharge water and potentially CCW onto the low undeveloped part of the ethanol plant site to the south. Failure of the west side dike would discharge water onto MidAmerican property. Failure through the north side levee is the only location where most of the impounded water in the pond could potentially be released. Failures through the other sides, particularly west and south sides, would result in only partial releases, because of relatively high outside toe elevations on these sides, relative to the basin bottom elevation. Failure of the levee and dike embankments around the South Ash Pond would not likely cause loss of life but would cause some environmental damage and minor economic damage to MidAmerican property and possibly to the ethanol plant site. Therefore, the South Ash Pond dam should be given a Low Potential Hazard Classification per the criteria used by EPA (Table 2.3).

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Table 2.1: Summary of Dam Dimensions and Size*		
	North Ash Pond	South Ash Pond
Dam Height (feet)*	11.2	6.6
Total Storage Capacity (acre-feet)	2045.5	1326.5
Crest Width (feet)**	10’	10'
Length (feet)	~11,522	~9,489
Side Slopes (inside) (horiz:vert)**	3:1	3:1
Side Slopes (outside) (horiz:vert)**	3:1	3:1
Hazard Classification***	Low	Low

**Based on data in MEC response to EPA’s RFI dated March 30, 2009; review of furnished data indicates maximum heights of 17.9’ for North Ash Pond & 8.8’ for South Ash Pond.*

***Based on furnished design information*

**** EPA Hazard Potential Classification*

Table 2.2: Size Classification* Per USACE ER 1110-2-106, September 26, 1979		
Category	Impoundment Storage (Acre-Feet)	Dam Height (Feet)
Small	Less than 1,000 but equal to or greater than 50	Less than 40 but equal to or greater than 25
Intermediate	Less than 50,000 but equal to or greater than 1,000	Less than 100 but equal to or greater than 40
Large	Equal to or less than 50,000	Equal to or less than 100

**Note: Size classification may be determined by either storage or height of structure, whichever gives the higher category.*

Table 2.3: Dam Hazard Potential Classification Used by EPA	
Category	Hazard Potential Description
High Hazard Potential	Dams where failure or misoperation will probably cause loss of human life.
Significant Hazard Potential	Dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.
Low Hazard Potential	Dams where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner’s property.
Less Than Low Hazard Potential	Dams where failure or misoperation results in no probable loss of human life or economic or environmental losses.

Table 2.4: Dam Hazard Classification* Per IA DNR	
Category	Hazard Description
Multiple Dams	Structures located in areas where failure of a dam could contribute to failure of a downstream dam or dams, the minimum hazard class of the dam shall not be less than that of such downstream structure.
High Hazard	Structures located in areas where failure may create a serious threat of loss of human life or result in serious damage to residential, industrial or commercial areas, important public utilities, public buildings, or major transportation facilities.
Moderate Hazard	Structures located in areas where failure may damage isolated homes, industrial or commercial buildings, moderately traveled roads or railroads, interrupt major utility services, but without substantial risk of loss of life. Structures that of themselves are of public importance.
Low Hazard	Structures located in areas where damages from a failure would be limited to loss of the dam, loss of livestock, damages to farm outbuildings, agricultural lands, and lesser used roads, and where loss of human life is considered unlikely.

**Iowa DNR, Technical Bulletin 16 – Design Criteria and Guidelines for Iowa Dams. December 1990.*

2.3 AMOUNT AND TYPE OF RESIDUALS CURRENTLY CONTAINED IN THE UNIT(S) AND MAXIMUM CAPACITY

The amount of CCW residuals currently stored in the units and maximum capacities are summarized in Table 2.5.

North Ash Pond – Based on information from MEC, this pond contains fly ash, bottom ash and boiler slag deposited over 32 years. This pond is currently active and remaining storage volume varies due to the excavation of ash for retail sale (beneficial reuse). Fly ash no longer is deposited in the pond. Fly ash disposal in the pond was terminated by December 31, 2007; fly ash is currently dry-disposed in an ash monofill. A total of 1,239.7 acre-feet of fly ash and bottom ash material were contained within the North Ash Pond, when last measured (March 17, 2009). As of 2009, the North Ash Pond had an estimated 39 percent remaining in total storage capacity. Pool elevation at the time of the site visit was estimated at about 967.5 feet, which was above the normal operating pool range, due to previous unusually wet weather conditions.

South Ash Pond – Based on information from MEC, this pond contains bottom ash, boiler slag, and pH-adjusted process water from the demineralization system deposited over 31 years. This pond is currently active. A total of 663 acre-feet of bottom ash and boiler slag material are contained within the South Ash Pond, when last measured (March 17, 2009). As of 2009, the South Ash Pond had an estimated 50 percent remaining in total storage capacity. Pool elevation at the time of inspection was estimated at about 970.8 feet, which was within the normal operating pool range.

Table 2.5: Amount of Residuals and Maximum Capacity of Unit*

	North Ash Pond	South Ash Pond
Surface Area (acre)	171	133
Current Storage Volume (acre-feet)	1239.7	663
Total Storage Capacity (acre-feet)	2045.5	1326.5

*Based on data in MEC response to EPA's RFI dated March 30, 2009

2.4 PRINCIPAL PROJECT STRUCTURES

2.4.1 Earth Embankment Dam

North Ash Pond – The dikes on the north and east sides and the levees on the south and west sides of the North Ash Pond are earth-fill embankments. The soils used for earth fill in the dikes appear to have been locally obtained from excavations made within the basin area and those in the pre-existing levees are believed to have been locally obtained, possibly from the borrow pits that originally existed within the basin area. Based on boring information for the monitoring well network (Appendix C -Doc 1.4), the virgin soils in the upper profile consist of predominantly clay and silt (fine-grained soils), and these appear to be the types of soils used in the earth-fill embankments. Deeper in the profile the soils are granular, consisting of sand and sand with varying amounts of silt. Specifications or notes concerning earth-fill embankment construction, such as placement moisture content, lift thickness, degree of compaction, etc., were not available. The length of the embankment forming the west side levee of the basin is approximately 3679 feet, and the embankment forming the south side levee is approximately 2746 feet. The total length of the perimeter dam is approximately 11,522 feet. The North Ash Pond is completely enclosed by the perimeter dam and does not receive surface runoff from outside the pond area. The basic design geometric features of the perimeter dam embankment are summarized in Table 2.1.

According to MidAmerican, the geometry of the dam (excluding levees along the creeks) has not been altered since the North Pond was placed into service in 1978. A representative design section of the levee embankment (South Side) is shown in Exhibit 1. As shown in this exhibit, the design called for 10-foot wide crest and 3 horizontal (H) to 1 vertical (V) side slopes. The final design grades of the levees and dikes of the North Ash Pond are shown on the Finish Grades plans in Appendix C - Doc 1.3. However, the crest of the south side levee is actually about 3 feet higher than shown on the Finish Grade plans. MidAmerican indicated that the USACE raised the Mosquito Creek and Pony Creek levees in the early 1980s, and the change in height resulted in a slope of the crest from elevation 982 feet to 983 feet. However, a recent survey of crest elevations around the perimeter of the pond suggests that the Mosquito Creek levee was not raised (see Appendix D - Item 2).

South Ash Pond **–** The dikes on the east, south, and west sides and the levee on the north side of the South Ash Pond are earth-fill embankments similar to those described above for the North Ash Pond. The length of the embankment forming the north side levee is approximately 2917 feet. The total length of the perimeter dam is approximately 9,489 feet. The South Ash Pond also is completely enclosed by the perimeter dam and the does not receive surface runoff from outside the pond area. The basic geometric features of the perimeter dam embankment are summarized in Table 2.1.

According to MidAmerican, the geometry of the dam (excluding levee along Pony Creek) has not been altered since the South Pond was placed into service in 1979. A representative design section of the levee and dike embankments is shown in Exhibit 2. However, the north levee embankment (along Pony Creek) is actually about 3 feet higher than shown on this section, and the east side dike embankment actually varies in elevation down to a low point of 973.8 feet on the south part of the dike. As noted above, MidAmerican indicated that the USACE raised the Pony Creek levee in the early 1980s. As shown in Exhibit 2, the design called for a 10-foot wide crest and 3 H to 1 V side slopes. A representative design section of 189th Street (south entrance to plant) along the top of the west and south dikes of the South Ash Pond is shown in Exhibit 3. As shown in this exhibit, the design called for a 20-foot wide gravel-surfaced roadway with 5-foot wide shoulders on either side along the dike crest; during the site visit the roadway was observed to be asphalt-paved. The final design grades of the levee and dikes of the South Ash Pond are shown on the Finish Grade plans in Appendix C - Doc 1.3. However, as noted above the crest of the north side levee is actually about 3 feet higher, and the crest of the south part of the east side dike is generally lower than shown on the Finish Grades plans. A recent survey of crest elevations around the perimeter of the South Ash Pond is included in Appendix D - Item 2.

The USACE is currently conducting a levee stabilization project, between the North and South Ash Ponds, by straightening and dredging Pony Creek.

2.4.2 Outlet Structures

North Ash Pond – Water ponds in the eastern half of the basin and can be discharged through outlet works located near the east end of the south side levee of the North Ash Pond. The outlet works consist of a concrete box with a 24-inch reinforced concrete pipe (RCP) conduit through the levee to discharge into Pony Creek. The discharge pipe extends from the embankment to the bank of Pony Creek. A sluice gate controls discharge through the outlet pipe. A slide gate or stop-log panel fitted in guides at the inlet end of the grated open-top concrete box sets the typical operating level of water in the pond. Water flows over the stop-log panel and under a concrete skimmer wall to the inlet chamber where water would pass through a metering flume before entering the outlet pipe, if the sluice gate is open. The outfall end of the pipe had a concrete end wall and a flap gate to prevent backflow of water into the pipe during flood stages in Pony Creek. However, the outfall section of the pipe has been detached but presumably will be replaced as the USACE completes dredging of Pony Creek. Design details of the outlet structure are shown in Appendix C - Doc 1.5 and in-part in Exhibit 1.

The water in the basin at the time of the site visit was estimated to be at elevation of 967.5 feet, which is 11.3 feet below the low point on the perimeter dam crest, but 5.5 feet above the typical operating pool elevation. At the time of the site visit, the sluice gate of the outlet structure was closed and no discharge from the structure was observed.

South Ash Pond – There is no outlet structure at the South Ash Pond. Water is recycled to the plant and reused. When the pool is at relatively high levels, as recently occurred due to unusually wet weather conditions, MidAmerican closely monitors the water level and curtails excess water being discharged into the pond. MidAmerican indicated that the “WSEC would consider in an emergency situation, to acquire a permit amendment” from the IA DNR “and divert some of the water from the South Ash Pond to the North Ash Pond by using portable pumps.”

The level of water in the basin at the time of the site visit was estimated to be at elevation 970.8 feet, which is 3.0 feet below the low point on the dam crest.

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2.5 CRITICAL INFRASTRUCTURE WITHIN FIVE MILES DOWN GRADIENT

Using Google Maps dated 2010, no “critical” infrastructure was observed within a 5-mile down-gradient radius. “Critical” infrastructure includes facilities such as schools and hospitals. There are 30 schools, 4 medical facilities, and 3 veterinary facilities located within the 5-mile radius, but all are located across the Missouri River or up-gradient to the north. These facilities are noted on the 5-mile radius map included in Appendix C - Doc 1.1 of this report.

In general, the land use surrounding the WSEC is agricultural and industrial. Flood impacts from postulated failure of the ash pond dams at the WSEC would impact immediately adjacent properties and primarily impact Pony Creek or Mosquito Creek. The stream distance to the Missouri River from the confluence of Pony Creek with Mosquito Creek at the ash ponds is less than ½ mile.

3.0 SUMMARY OF RELEVANT REPORTS, PERMITS AND INCIDENTS

3.1 SUMMARY OF REPORTS ON THE SAFETY OF THE MANAGEMENT UNIT(S)

The WSEC conducts internal quarterly inspections and informal daily inspections of the dam embankments; however, the inspections have not been documented and therefore no inspection reports were available for review.

The levees bounding the North and South Ash Ponds along Pony Creek are a part of the Levee District of Pottawattamie and Mills Counties (P & M Levee District); the levee bounding the North Ash Pond along Mosquito Creek is part of the Levee District of Council Bluffs. The levee districts are responsible for the embankments that form the flood-control levees. The U.S. Army Corps of Engineers (USACE) assists the levee districts in the maintenance and inspection of the levees, as well as with design and construction of improvements, rehabilitation, or repair. The USACE is currently conducting an improvement project along the Pony Creek reach between the two ash ponds. It is understood from MidAmerican staff that a geotechnical study of the levees bounding the ash ponds along Pony Creek has been completed as part of the levee improvement project. A report of the geotechnical study is currently under review by the USACE and the P & M Levee District and therefore could not be released for review in this assessment. However, MidAmerican had a separate preliminary geotechnical study conducted for use in this assessment; the results of that study are summarized in Chapter 7.0 Structural Stability.

3.2 SUMMARY OF LOCAL, STATE AND FEDERAL ENVIRONMENTAL PERMITS

The WSEC is currently regulated under NPDES Permit No. 78-20-1-01 (see Appendix C - Doc 1.6). This permit was effective on February 27, 2003, amended October 16, 2006, and expired on February 26, 2008, according to the furnished documentation.

The North Ash Pond is regulated for water quality by the IA DNR. Groundwater monitoring/sampling is conducted at a number of points (water-quality wells) around the North and South Ash Ponds. Water sampling at the outlet structure of the North Ash Pond is also conducted to monitor the quality of discharge that reaches Pony Creek, a tributary to Mosquito Creek, which is tributary to the Missouri River.

3.3 SUMMARY OF SPILL/RELEASE INCIDENTS (IF ANY)

North Ash Pond – There have been no reported spill/release incidents at this basin.

South Ash Pond – There have been no reported spill/release incidents at this basin.

4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

4.1 SUMMARY OF CONSTRUCTION HISTORY

4.1.1 Original Construction

The original design of the WSEC surface impoundments was prepared by Black & Veatch Consulting Engineers. The design drawings were sealed by a Professional Engineer, Robert A. DeCamp, and the drawings were issued for contract in March 1974. The name of the contractor for construction is not available, and it is not known whether the basins were constructed under the supervision of a Professional Engineer. Therefore, little is known of original construction, other than the two basins were constructed sometime between 1974 and 1979, when the basins were placed into service. The levees along Pony Creek and Mosquito Creek existed before construction of the ash basins; it is understood that the levees are designed for the 100-year flood. The USACE provides assistance to the levee districts with levee design, construction, maintenance, and inspection issues.

North Ash Pond –This pond was constructed around a smaller pre-existing incised pond (old borrow pit). The ash pond was formed by constructing earth-fill embankments on the north and east sides; the north side dike tied-in to the existing west side levee along Mosquito Creek at the northwest corner, and the east side dike tied-in to the existing south side levee along Pony Creek at the southeast corner. A design section shows that the south side levee along Pony Creek was to be raised "by others" (see Exhibit 1). Finish Grades plans show that the finished top elevation was to be 980 feet all around the basin; this apparently was the elevation of the Pony Creek levee prior to its being raised "by others." Approximately 80 percent of the basin area was excavated down to create storage space and to provide borrow soil for dike construction. The planned bottom elevation was 948 feet, but it is not known if excavation actually extended down to that elevation, since the actual bottom elevation was to be field determined by earth-fill requirements. The basin was not lined. The Finish Grades plans show that four existing "seepage wells" 160 feet apart in a line along the inside toe (inside proposed basin) of the existing Mosquito Creek levee were relocated slightly to the east because that part of the levee alignment was revised for the ash pond construction at the southwest corner.

South Ash Pond – This pond was also constructed around a smaller pre-existing incised pond (old borrow pit). The ash pond was formed by constructing earth-fill embankments on the east, south, and west sides; the east side dike tied-in to the existing north side levee along Pony Creek at the northeast corner, and the west side dike tied-in to the existing north side levee along Pony Creek at the northwest corner. There is no design section showing that the north side levee was to be raised "by others," as was done for the south side levee for the North Ash Pond, but it evidently was raised. The crests of the dikes on the south and west sides were made 30 feet wide to accommodate a roadway and shoulders for the south entrance (189th Street) to the plant The interior of this basin area was also excavated down to create storage space and to provide borrow soil for dike construction. The planned bottom elevation was 961 feet, but it is not known if excavation actually extended down to that elevation, since the actual bottom elevation was to be field determined by earth-fill requirements. This basin was not lined.

4.1.2 Significant Changes/Modifications in Design since Original Construction

The alignment of the SIRE rail line to a new ethanol plant to the south was constructed within the ash ponds. The rail line runs north-south along the west part of the ash ponds. The rail line was constructed on an earth-fill embankment. Culverts through the embankment allow drainage from the west side to the east side.

A modification in the South Ash Pond involved reconfiguring the flume to the re-circulation pump structure. The flume was shortened and re-aligned, which primarily involved removing an embankment that extended along the former flume.

4.1.3 Significant Repairs/Rehabilitation since Original Construction

There have been no significant repairs/rehabilitation made to the ash ponds since the original construction. As previously mentioned, the USACE is currently conducting a levee stabilization project, between the North and South Ash Ponds, by straightening and dredging Pony Creek.

4.2 SUMMARY OF OPERATIONAL HISTORY

4.2.1 Original Operational Procedures

The furnished documents do not include the original operational procedures. However, it is presumed that original operation was much as it is today with respect to the manner in which the ash is transported and disposed, i.e., by sluicing with water into the basins where the ash particles are allowed to settle out. In the North Ash Pond water was discharged through the outlet structure to Pony Creek after assurance that the water met permit requirements. Carbon dioxide (CO_2) was infused with the water at the inlet chamber to adjust pH prior to discharge. As in current operation at the South Ash Pond, the water was re-circulated back to the plant for reuse as sluice water for the boiler Unit 3. The inlet flume to the re-circulation pump was contained between the inside slope of north side levee and a long interior dike embankment parallel to the levee. It also appears that at least one other interior finger dike was used as a baffle, to direct circulation within the basin away from the inlet flume.

4.2.2 Significant Changes in Operational Procedures since Original Startup

No documents were provided to indicate that basic operational procedures have significantly changed since original startup. However, fly ash is no longer sent to the North Ash Pond; the wet disposal of fly ash was discontinued on December 31, 2007. All fly ash now is captured in silos and is sold for beneficial reuse or sent to an ash monofill. Mining of the C-Stone, or solidified fly ash, from the North Ash Pond for beneficial reuse was started at an undetermined time after substantial cemented fly ash had accumulated in the basin.

4.2.3 Current Operational Procedures

The North Ash Pond is operated and monitored for water quality under an approved NPDES permit. As previously discussed, water is not discharged from the South Ash Pond but is recycled back to the plant for reuse. If there ever is a need to remove water from the South Ash Pond, it would be done with portable pumps discharging to the North Ash Pond after obtaining a temporary discharge permit from the IA DNR. Current operational procedures are discussed in more detail in Section 8.1 Operational Procedures.

4.2.4 Other Notable Events since Original Startup

The surface impoundments at the WSEC have been determined to be one of only two breeding grounds in the state of Iowa for two bird species, one of which is listed as endangered and the other listed as threatened. MidAmerican environmental personnel have developed and implemented a conservation and management plan for the protected species, which has some impact on operations at the ash ponds. See discussion of Least Tern and Piping Plover Conservation Management Plan in Section 8.1 Operational Procedures.

5.0 FIELD OBSERVATIONS

5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Frederic C. Tucker, PE and Mark Hoskins, PE collected available data and documents and made field observations during a site visit on September 15, 2010, in company with the participants listed in Section 1.3. The design engineer of record for North Ash Pond and South Ash Pond was not present or available to assist with answering questions about these basins.

The site visit began at 9:30 AM. Weather conditions during the visit were 80 degrees Fahrenheit, sunny, and dry. Photographs were taken of conditions observed. Photographs referenced below are contained in Appendix A and Field Observation Checklists are included in Appendix B.

The overall visual assessment is that the earthen embankments that impound the North Ash Pond and the South Ash Pond are in relatively good condition. No visual signs of imminent instability or inadequacy of the principal structures at these basins that would require emergency remedial action were observed. No evidence of past repairs was observed. Observations of note include:

- Slough on outside slope of levee on north side of South Ash Pond (see Photos S.14,S.15);
- Dip in crest and low section on south part of dike embankment on east side of South Ash Pond (see Photos S.19, S.21);
- Broken end section of outlet pipe from the North Ash Pond tossed up onto the north Pony Creek bank (see Photos O.3, O.4);
- Wave erosion and steep slope angle just above water line on inside slope, particularly around northeast corner of both ash ponds (see for example Photos N.11, N.12, N.25, S.7 in distance, S.15 in background);
- Trees and woody vegetation on outside slope of dike embankment on north side of North Ash Pond (see Photos N.20 – N.23);
- Gravel (C-stone) sediment in overflow structure at entrance to outfall pipe at North Ash Pond (see Photo O.1);
- Thick bromegrass and tall weeds, such as sunflowers, golden rod, etc. generally covering embankment slope surfaces (see Photos N.11, N.12, N.21, N.22, N.37, N.39, S.9, S.11, S.12, etc.); and
- A small erosion gully formed adjacent to the outside slope of the dike on the north side of the North Ash Pond, near the railroad spur close to northwest corner (see Photo N.17).

It was observed that soils have been exposed along Pony Creek due to the recent USACE dredging/straightening project. Due to the thick vegetative growth, embankment slope surfaces were generally too obscured to allow close observation. However, no obvious indications of stability problems were observed, except for the slough (Photos S.14, S.15) on the outside slope of the levee on the north side of the South Ash Pond, where the USACE dredged portions of Pony Creek. MidAmerican had offered to place riprap on this sloughed area and was asked to delay and allow the USACE project to continue when water elevations drop. The increased rainfall had kept creek elevations high through the 2010 summer.

Along the North Ash Pond the Interstate 29 drainage swale held about a foot of water in the lowest part during the September 15th site visit (see Photos N.29 and N.30). It appeared that trees had been cut to clear out this swale and some tire tracks were evident. The cut trees were not removed from the swale. There were no other significant wet areas evident adjacent to the outside toes of the perimeter dikes around the North and South Ash Ponds.

5.2 NORTH ASH POND

5.2.1 Embankment Dam and Basin Area

Crest

The area immediately adjacent to the west side of the pool of water in the North Ash Pond includes the C-stone mining area and the SIRE railroad embankment, but the western limit of the ash pond is the levee along Mosquito Creek. The crest around all sides of the North Ash Pond is accessible with automobiles.

Typical views of the crest around the North Ash Pond include:
West embankment: Photos N.13, N.47, N.49
East embankment: Photos N.26, N.32, N.34, N.38
North embankment: Photos N.11, N.12
South embankment: Photos N.39-N.41, N.43

No major depressions, sags, tension cracks or other signs of significant settlement or mass soil movement were observed. No tension cracks which might suggest soil shear failure were observed in the crest or along the edge of the crest.

Outside Slope and Toe

The outside slopes and toe areas are generally vegetated with bromegrass and weeds along all sides; the north outside slope also has a few trees and some woody vegetation. The swale area on the east side has some brush and tall weeds, including some wetland vegetation. The south side toe area is the north bank of Pony Creek. Pony Creek is being improved from a USACE straightening/dredging project that is not yet completed.

Typical views of the outside slope and toe around the North Ash Pond include:
West embankment and Mosquito Creek: Photos N.1-N.4, N.14
East embankment: Photos N.26, N.28-N.31, N.35, N.38, N.42
North embankment: Photos N.15-N.24
South embankment and Pony Creek: Photos N.39, N.41, N.43

No areas of significant erosion were observed. There was gully erosion evident for a small section of the north side outside slope in groin at the railroad spur (Photo N.17). No obvious signs of slumps, slides, bulges, tension cracks, seepage, or animal holes were observed.

The Interstate 29 drainage swale on the east side was holding water about midway along the swale in the toe area next to the outside slope (Photo N.29 and N.30). This area does not appear to be seepage related. No active erosion was observed along the swale.

Inside Slope and Basin Area

The inside slopes of the North Ash Pond are covered with bromegrass and tall weeds in patches and do not show signs of sloughing; some general wave erosion was observed along the waterline, which appeared more severe in the northeast corner of the pond, as previously noted. No other significant erosion was noted on the inside slopes. The north inside slope is steep near the edge of water. The west dike (Mosquito Creek levee) is set back several hundred feet from the edge of water. The railroad spur was built between the water and the west levee. Culverts were placed under the railroad embankment to allow water to pass under the railroad but were not passing water at the time of the site visit. C-Stone is excavated for beneficial reuse in portions of the North Ash Pond.

There is also a bird sanctuary for portions of the North Ash Pond and MidAmerican has been careful to protect areas of the pond to allow the birds to migrate and nest during several months of the year.

Typical views of the inside slope and toe and other features around and within the North Ash Pond include:
West embankment: Photos N.46, N.48-N.49
Railroad embankment: Photo N.44
East embankment: Photos N.25, N.27, N.34, N.36, N.38
North embankment: Photos N.11, N.12
South embankment: Photos N.37, N.40
Basin Area: Photos: N.5-N.10
Sluice Discharge Area: Photos N.45-N.45.d

No slumps, slides, or other signs of shear failure were observed in the visible parts of the slopes above the water level. The surface of the exposed ash fill is generally maintained free of vegetation, except for minimal scrub vegetation in most areas, as this is the kind of habitat preferred by the protected birds; however, the area surrounding the sluiced discharge is generally covered with a relatively thick growth of small trees and underbrush.

Abutments and Groin Areas

There are no abutments, and the only groins are those formed where the railroad embankment intersects the perimeter dike. Gully erosion was observed in the east-side groin on the outside slope of the dike embankment on the north side of the North Ash Pond (Photo N.17). No other erosion, or displacements, or seepage was observed at these groins.

5.2.2 Outlet Structures

Overflow Structure

The overflow structure for the North Ash Pond is located near the southeast corner of the pond. The structure is shown in Photos N.33, O.1-O.4. The outfall structure is a grated concrete rectangular weir inlet box. The concrete box overflow structure surrounding the inlet end of the discharge pipe was observed to be in good condition, although there appears to be C-stone gravel filling and blocking some of the box structure, which has a concrete skimmer wall that extends down to within 3 feet of the bottom of the structure, according to furnished design drawings; rough measurements made on the inside of the skimmer wall in the field suggests that the gravel sediment may be blocking the bottom 2 feet of the 3-foot opening below the skimmer wall. The outfall pipe is a 24-inch diameter RCP; the end section, including end wall and flap gate appeared to have been excavated during the USACE Pony Creek dredging/straightening project (Photo O.4).

Outlet Conduit

As noted above, the outlet conduit is a 24-inch diameter RCP that has a damaged end section. None of the pipe was visible, except for the damaged end section, which was lying on the creek bank. The sluice gate at the inlet end of the pipe was closed and water was not flowing through the pipe during the site visit. There are no other outfalls for the North Ash Pond.

Emergency Spillway (If Present)

There is no emergency spillway.

Low Level Outlet

There is no low level outlet.

5.3 SOUTH ASH POND

5.3.1 Embankment Dam and Basin Area

Crest

The area immediately adjacent to the west side of the pool of water in the South Ash Pond includes the SIRE railroad embankment, but the western limit of the ash pond is the original west dike and plant yard and building pad areas. The low area between the railroad embankment and the west side does not receive sluiced ash. The crest around all sides of the South Ash Pond is accessible with automobiles.

Typical views of the crest around the South Ash Pond include:
West embankment: Photo S.27
East embankment: Photos S.13, S.18, S.19, S.21
North embankment: Photos S.9, S.11
South embankment: Photos S.22

No major tension cracks or other signs of shear failure or mass soil movement were observed on the crest. The dike crest on the south part of the dike on the east side of the pond is significantly lower than design (Photos S.19, S.21), as discussed in some detail elsewhere in this report; the reason for this very low section is currently unexplained. There was one deep rut within the asphalt-paved roadway on the south side dike, which appeared to be a subgrade failure as a result of heavy truck traffic.

Outside Slope and Toe

The outside slopes and toe areas are generally covered with grass and weeds along the north, east, and south sides with no areas of significant erosion. The swale between the east side dike embankment and the I-29 roadway embankment is generally covered with a growth of tall weeds, bushes and some small trees. On the west side the outside area is largely plant yard and building pad areas with little or no slope down from crest elevation. As previously mentioned, Pony Creek is currently being improved under the USACE's charge. There is a significant slough on the outside slope of the levee on the north side adjacent to Pony Creek (Photo S.14, S.15).

Typical views of the outside slope and toe around the South Ash Pond include:
West embankment: Photo S.27 (visible in background)
East embankment: Photos S.13, S.18
North embankment: Photos S.10, S.12, S.14, S.15, S.17 (Drainage structure from E. swale)
South embankment: Photo S.24

Except for the Pony Creek sloughing there are no other obvious signs of slumps, slides, bulges, tension cracks, seepage, or animal holes in the outside slope.

Inside Slope and Basin Area

The inside slopes of the South Ash Pond are covered with grass and some tall weeds and do not show signs of sloughing; as in the North Ash Pond, some general wave erosion was observed along the waterline, which also appeared more severe in the northeast corner of the pond. No other significant erosion was noted on the inside slopes. The north inside slope of this basin also is steep near the edge of water. The original west side is set back a couple of hundred feet from the edge of water. The railroad spur was built between the water and the west slope of the basin. Culverts were placed under the railroad embankment to allow water to pass under the railroad but were not passing water at the time of the site visit.

Typical views of the inside slope and toe and other features around and within the South Ash Pond include:
West side slope and area between west side and railroad embankment: Photos S.5-S.6, S.27
Railroad embankment: Photos S.4, S.26
East embankment: Photos S.19, S.21
North embankment: Photos S.8, S.10, S.11, S.16
South embankment: Photos S.20, S.22-S.23, S.25
Basin Area: Photos: Photos S.1, S.1.a, S.2
Sluice and Drain Line Discharge Area: Photos S.3-S.4
Pump Structure: Photo S.4

No slumps, slides, or other signs of shear failure were observed in the visible parts of the slopes above the water level. The surface of the exposed ash fill is generally bare.

Abutments and Groin Areas

There are no abutments and the only groins are those formed where the railroad embankment intersects the perimeter dike. No significant erosion, displacements, or seepage was observed at these groins.

5.3.2 Outlet Structures

Overflow Structure

There is no gravity-flow outlet structure at the South Ash Pond. The water level is regulated by the amount of inflow to the pond and the amount of water pumped back to the plant from the pond for reuse. The only discharge point permitted by the IA DNR is the outfall from the North Ash Pond.

Outlet Conduit

There is no outlet conduit.

Emergency Spillway (If Present)

There is no emergency spillway.

Low Level Outlet

There is no low level outlet.

6.0 HYDROLOGIC/HYDRAULIC SAFETY

6.1 SUPPORTING TECHNICAL DOCUMENTATION

6.1.1 Floods of Record

Both ash ponds are totally contained within perimeter dikes and do not receive off-site natural drainage. Therefore, they do not receive flood inflows from off-site. The source of water into the ponds is sluice water, plant drainage and precipitation that falls directly into the basins. Historic climate data available on-line from the High Plains Regional Climate Center indicate that the record 24-hour (1 day) precipitation in the area (Omaha Eppley Airfield) was 6.46 inches on August 7, 1999 for the period of record 1948 to 2010. (This record holds also for the period of record 1871 to 2010 for the Omaha area in the NOAA Online Weather Data.) Hearsay evidence from MidAmerican staff is that, due to the very wet weather conditions occurring in recent months, the water levels in the ash ponds have been at the highest levels they have seen. The water level in the South Ash Pond was at a record level at about 2.0 feet below the low point on the crest. The record water level in the North Ash Pond is unknown, but still had substantial freeboard even with the record rainfall this year. MidAmerican has indicated that flow in the Missouri River was at a record 30-year high level this year at a location just a few miles north of the plant, according to the USACE website.

6.1.2 Inflow Design Flood

The ash ponds at the WSEC do not receive uncontrolled inflows from off-site (at least not inflows up to the 100-year flood). MidAmerican representatives stated that the WSEC plant is designed to be protected against the 100-year flood. In fact, the more significant hydrologic issue with the ash ponds is not overtopping of the perimeter dikes by impounded water, but overtopping of the dikes (levees) by flood waters in Pony Creek and/or Mosquito Creek into the basins. It is understood from MidAmerican personnel that the levees which bound the south and west sides of the North Ash Pond and the north side of the South Ash Pond are to provide protection against the 100-year (1% annual chance) flood under the standards of the levee districts. Thus, flooding events greater than the 100-year flood could produce flood water in Pony Creek that would overtop the levees and inundate both ash ponds and/or could produce flood water in Mosquito Creek that would overtop the levee on the west side of the North Ash Pond.

For ash ponds that are totally contained within a perimeter dike system, such as the ash ponds at the WSEC, safe containment of water within the basins is provided by maintaining sufficient freeboard to contain 100 percent of precipitation over the basin area from the appropriate design storm. In this case, based on the 100-year flood design of the levees, the appropriate design storm for containing 100 percent of precipitation over the basin areas is bounded by the 100-year storm. Based on the Intermediate Size Classification and Low Hazard Potential Classification assigned to both of the ash ponds (see Section 2.2 of this report), the "spillway design flood" (SDF) criterion is 100-year flood to ½ probable maximum flood (1/2 PMF), according to USACE ER 1110-2-106 (September 26, 1979).For these basins with only uncontrolled inflow as precipitation, this criterion can be taken as 100-year precipitation (P100) to ½ Probable Maximum Precipitation (½ PMP). By Iowa Department of Natural Resources´ "Design Criteria and Guidelines for Iowa Dams" (December 1990), for "low hazard dams" not classified as "major structures," the design rainfall (R_D) = P100 + 0.12 (PMP – P100). From "Iowa Precipitation Frequencies" (1988): P100 = 6.7 inches (24-hour duration); PMP = 32.5 inches (all season, 24-hour duration, 10 sq. mi.); and R_D = 9.8 inches, which is within the USACE criterion; this design rainfall can be taken as the design "inflow" that the ash basins should safely accommodate.

6.1.3 Spillway Rating

No spillway rating was provided for the outlet works at North Ash Pond. As previously described, there is no outlet at the South Ash Pond. It is noted that there is no need for a spillway rating for the outlet works at the North Ash Pond in assessing hydrologic/hydraulic safety during major flooding events, since flow out of the North Ash Pond through the outlet works would not be significant and eventually not possible as the stage of water flow during flood in Pony Creek builds and exceeds the water level in the ash pond.

6.1.4 Downstream Flood Analysis

No downstream flood analysis has been provided for the ash ponds. A qualitative analysis based on field observations and review of available data is as follows:

The most likely flood scenario for both ash ponds is inundation of the ponds by extreme flooding (greater than 100-year flood) in Pony Creek. During such a flood the levees that bound the ash ponds on each side of Pony Creek would be overtopped, allowing flood water to enter the basins and potentially fill them to the top of the lower dikes that enclose the other sides of the basins. Extreme flooding (greater than 100-year flood) in Mosquito Creek would likewise overtop the levee that bounds the west side of the North Ash Pond.

If the basins are filled with flood water, the lower dikes that enclose the other sides of the basins would be overtopped at the low points on their crests. At the South Ash Pond this would most likely occur at the low section of the south part of the dike on the east side; flood water would spill into and inundate the drainage swale between the east dike and the I-29 southbound roadway embankment, then flow to the south to a drainage ditch and adjacent land (ethanol plant site) on the south side. The immediately adjacent part of the ethanol plant site is a low area overgrown with bushes and small trees. The interstate roadway embankment appeared to be higher than the dike, particularly near the south end of the bridge over Pony Creek.

At the North Ash Pond overtopping would occur practically anywhere along the dikes on the east and north sides. Flood water overtopping the east dike would spill into and inundate the drainage swale between the east dike and the I-29 southbound roadway embankment, then flow to the north to a drainage ditch and adjacent farmland on the north side. The roadway embankment along this section appeared to be higher than the dike near the north end of the bridge over Pony Creek but lower where it parallels the north part of the dike. Flood water overtopping the north dike would spill onto the farm road along the dike toe and to the drainage ditch and adjacent farmland along the north side. Overtopping of the west levee by flood water in Mosquito Creek would inundate the space between the levee and the railroad embankment in the North Ash Pond.

The overtopped levees and dikes could be breached or partially breached, causing release of some of the originally impounded water through the breaches when the flood water recedes. Some ash would likely be eroded and transported with the water flowing out of the basins through the breaches. Owing to the cemented nature of at least the upper, exposed deposits of the fly ash in the North Ash Pond, it is likely that little of this material other than some gravel-sized, detached pieces would be moved out of the basin. Some of the bottom ash, which is cohesionless, in both basins could potentially be transported out of the basins and be deposited in the adjacent drainage swales and farmland and along Pony Creek and Mosquito Creek to the Missouri River less than ½ mile away.

In short, the downstream flood risk posed by the ash ponds is not significant compared to the flood risk posed by Pony Creek and Mosquito Creek. In addition, the downstream areas along Pony Creek and Mosquito Creek from the ash ponds to the Missouri River are confined to MidAmerican property, although any peripheral breaches in the dikes could potentially impact adjacent farmland to the north and part of the ethanol plant site to the south.

MidAmerican has indicated that overtopping of flood water from the creeks into the ash ponds is considered to be very low risk, since the design high water elevation based on the 100-year flood insurance study is 975.1 feet and the minimum top elevation of the levee (along Pony Creek) is 982 feet. MidAmerican has further indicated that they would work with the local USACE District and the levee districts to assist in emergency response to shore up Pony Creek and Mosquito Creek in the unlikely event of flood water threatening to overtop the levees.

6.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

No hydrologic/hydraulic analyses are available for the ash ponds. However, rigorous analyses are not needed for evaluation of hydrologic safety of these basins, which are totally contained within perimeter dike systems and do not receive off-site drainage. Simple calculations as discussed in the following section are sufficient. Off-site storm water can enter the basins only if the flood-protection levees along Pony Creek and Mosquito Creek are overtopped during major flood exceeding the 100-year flood. The levee districts and/or USACE presumably have technical documentation supporting the 100-year design of the flood-protection levees.

6.3 ASSESSMENT OF HYDROLOGIC/HYDRAULIC SAFETY

The North Ash Pond has a reported freeboard of 18 feet between the normal operating pool level and the perimeter dike crest elevation, and the South Ash Pond has a reported freeboard of 4 feet. From simple calculations both ash ponds have sufficient flood storage capacity between normal operating pool levels and the dike crest elevations to safely accommodate a design rainfall of 9.8 inches (0.82 feet), which is between the 100-year precipitation and ½ PMP and in accord with the Iowa Department of Natural Resources´ criterion. In fact, both ash ponds can accommodate much higher rainfalls. It appears that the North Ash Pond could accommodate the full PMP (32.5 inches), even considering interior drainage from high areas to low areas with area ratios up to 6; and it appears that the South Ash Pond could accommodate ½ PMP (16.25 inches), similarly considering interior drainage from high areas to low areas with area ratios up to about 3. Thus, the hydrologic safety of the ash ponds is more controlled by the potential for external flooding into the ash basins rather than overtopping of water impounded within the basins. The hydrologic safety of the ash ponds is reliant on the flood-protection levees, which are required by the levee districts to provide protection up to the 100-year flood. This is at the lower limit of the USACE criterion for the size and hazard potential classifications assigned to the WSEC ash ponds.

7.0 STRUCTURAL STABILITY

7.1 SUPPORTING TECHNICAL DOCUMENTATION

7.1.1 Stability Analyses and Load Cases Analyzed

North Ash Pond Dike and South Ash Pond Dike – No stability analyses appear to have been performed for the ash pond dikes during original design studies performed prior to issue of the contract documents in 1974. As previously mentioned, a geotechnical study of the levees bounding the North and South Ash Ponds along Pony Creek has been completed as part of the levee improvement project being conducted by the USACE, but the report of that geotechnical study is currently under review by the USACE and the P&M Levee District and therefore could not be released for review in this assessment. However, MidAmerican engaged Terracon Consultants, Inc, (Terracon) to perform a preliminary geotechnical study of the ash pond dikes under MidAmerican's responsibility at both the North Ash Pond and the South Ash Pond, to provide geotechnical data and stability analysis results for use in this assessment. The results of that study are presented in Terracon's Geotechnical Engineering Report, dated October 22, 2010, included in Appendix D - Item 3 for reference. The field exploration program included 5 test borings, including both disturbed and relatively undisturbed soil samples, and 3 supplementary electric-cone soundings at eight selected locations on the crest of the perimeter dikes on the south and east sides of the South Ash Pond and east and north sides of the North Ash Pond. Standard penetration testing (SPT) was performed in granular soils and calibrated hand penetrometer tests were performed on cohesive samples. Laboratory tests were performed on both the disturbed and relatively undisturbed samples to determine classification and engineering properties and parameters of the dike embankment fill, and foundation soils. The laboratory tests included determinations of: moisture content, dry density, Atterberg limits (plasticity), grain size distribution, unconfined compressive strength, and triaxial shear strength (both Unconsolidated Undrained and Consolidated Undrained). Seven critical cross sections of the perimeter dikes were selected for global stability analyses. The geometry of the sections was taken from previous survey by HGM Associates, Inc. (HGM). Slope stability analyses of both the inside (upstream) and outside (downstream) slopes were performed for the following cases:

- Static stability under steady-state seepage conditions with a maximum operating pool elevation of 970.0 feet for the North Ash Pond and 971.3 feet for the South Ash Pond, and
- Seismic stability (pseudo-static method) using a horizontal seismic coefficient of 0.0428 and vertical seismic coefficient of zero, also assuming maximum operating pool elevations in the ash ponds.

Four of the critical cross sections occur on the perimeter dike at the South Ash Pond (Sections A-A, C-C, E-E, and F-F in the geotechnical report); three occur on the perimeter dike at the North Ash Pond (Sections L-L, M-M, and O-O in the geotechnical report).

Static stability under "undrained" conditions for the soils was not analyzed, as Terracon did not believe that undrained shear strength of the soils was a valid state after the many years the dikes have been in place. Terracon indicated that the "drained" shear strengths used for the cohesive soils in the embankment and foundation took into consideration long-term strain softening; therefore the design shear strength parameters selected for use in the analyses are lower than the parameters given by "peak" strengths from the consolidated undrained triaxial tests that were performed. Terracon also indicated that the rapid draw-down case for the upstream slope also was not analyzed because there is no mechanism for rapidly withdrawing water from the ash ponds.

The seismic stability analysis using the pseudo-static method was indicated to be run at 2/3 of the design ground acceleration. Terracon interpreted the peak ground acceleration at the project site to be 0.0455g from the 2008 USGS Earthquake Hazard Maps for 2 percent probability of exceedance in 50 years.

The slope stability analyses were performed using the computer program SLOPE/W developed by Geoslope Inc. In the static stability analysis for steady state seepage conditions factors of safety were computed for potential circular arc rotational failures to search for the failure arc with lowest factor of safety. Similarly, the seismic (pseudo-static) stability analysis was performed. The computer program used the Morganstern-Price method to calculate the critical failure surfaces. The results are presented in Terracon's Geotechnical Engineering Report in Appendix D - Item 3 and summarized in Subsection 7.1.4.

No other potential failure modes were analyzed or evaluated, such as seepage uplift (high exit gradients) at the embankment toe due to underseepage, or liquefaction potential during seismic shaking.

7.1.2 Design Properties and Parameters of Materials

North Ash Pond Dike and South Ash Pond Dike – The borings and cone probes made by Terracon indicate that the dike embankments consist predominantly of fat clay underlain by a foundation soil profile consisting of an upper layer of fat clay and a lower layer of silty sand of undetermined depth; the borings were typically terminated in the silty sand at depths of 50.0 feet, except in Boring B-2, which was still in the fat clay at the 50-foot termination depth. The upper fat clay layer below the embankment in the two borings (B-1 and B-2) made in the South Ash Pond perimeter dike is quite thick (25.5 feet to more than 40.0 feet) compared to the fat clay foundation soil layer thickness (4.5 feet to 6.5 feet) penetrated in the three borings (B-4, B-5, and B-6) made in the North Ash Pond perimeter dike. In addition, the thick fat clay layer becomes progressively softer, ranging from stiff or very stiff in the upper part of the layer to very soft in the lower part of the layer. The relative density of the underlying silty sand layer ranges from loose to dense but is typically medium dense. Table 7.1 shows the design properties and parameters used in the analysis sections. Specific design data for each section are shown on the analysis sections contained in Terracon's Geotechnical Engineering Report in Appendix D - Item 3.

Table 7.1: Design Properties and Parameters of Materials used in Analyses

Material	Total Unit Wt. (pcf)	Drained Strength Parameters	
		C´ (psf)	Ø´ (deg)
Embankment Fill	120	50	26
Fat Clay Foundation Soils	120	50	26*
Silty Sand	125	0	29

**20º used for soft and very soft clay layers below elevation 950 feet. See Terracon's report in Appendix D - Item 3 for source of information in this table.*

7.1.3 Uplift and/or Phreatic Surface Assumptions

North Ash Pond Dike and South Ash Pond Dike – The phreatic surface or piezometric level in the embankment slope stability analysis sections appears to have been based on maximum operating pool level on the inside and seepage line cropping out at or near the outside toe, with piezometric level varying linearly through the embankment between the inside and outside water levels.

From visual observations in the field, the phreatic surface did not appear to crop out on the outside slopes of the perimeter dikes under the higher than normal pond water levels existing at the time of the site visit, although wet soil conditions were noted in the swale on the east side of the perimeter dikes, between the dikes and the I-29 embankment. The above noted phreatic surface assumption is consistent with this observation.

7.1.4 Factors of Safety and Base Stresses

North Ash Pond Dike and South Ash Pond Dike – The computed factors of safety for the various sections analyzed for static stability and for seismic (pseudo-static) stability are shown in Table 7.2 and Table 7.3, respectively.

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Table 7.2: Static Stability Factors of Safety (Steady State Seepage)			
		Calculated Minimum Factor of Safety (FS)*	
Location	**Section**	**Upstream Slope**	**Downstream Slope**
South Ash Pond Perimeter Dike	A-A	1.73	1.79
	C-C	1.50	1.82
	E-E	4.05	2.20
	F-F	1.66	1.64
North Ash Pond Perimeter Dike	L-L	1.70	1.61
	M-M	1.74	1.87
	O-O	1.57	1.64

**For deep-seated potential failure surfaces that extend to the crest; shallow surfaces near toe may be lower. See Terracon's report in Appendix D - Item 3 for source of information in this table.*

The U.S. Army Corps of Engineers (USACE) recommended minimum FS criterion is 1.0 for seismic stability.

Table 7.3: Seismic (Pseudo-Static) Stability Factors of Safety (Seismic Coefficients = 0.0428 Horiz. & 0 Vert.)			
		Calculated Minimum Factor of Safety (FS)*	
Location	**Section**	**Upstream Slope**	**Downstream Slope**
South Ash Pond Perimeter Dike	A-A	1.52	1.57
	C-C	1.39	1.6
	E-E	2.42	1.82
	F-F	1.45	1.44
North Ash Pond Perimeter Dike	L-L	1.50	1.40
	M-M	1.49	1.60
	O-O	1.39	1.46

**For deep-seated potential failure surfaces that extend to the crest; shallow surfaces near toe may be lower. See Terracon's report in Appendix D - Item 3 for source of information in this table.*

The USACE recommended minimum FS criterion is 1.0 for seismic stability.

7.1.5 Liquefaction Potential

No liquefaction potential analyses for the dike embankments that impound the ash ponds were performed in Terracon's preliminary geotechnical study. Such analyses may have been performed in the geotechnical study of the Pony Creek levees for the USACE and P&M Levee District, but that study is currently not available for review. Limited available subsurface information from the Terracon preliminary geotechnical study shows that the silty sands underlying the fat clay foundation soils typically have medium dense relative density although pockets of loose relative density are present. The lowest standard penetration test (SPT) resistance obtained in the loose silty sand pockets was 6 blows per foot. Thus, overall the silty sand foundation soils do not appear to be susceptible to liquefaction under the low earthquake intensities expected in the region; even though the loose pockets of silty sand probably would be marginally susceptible to liquefaction under strong earthquake shaking.

7.1.6 Critical Geological Conditions and Seismicity

The ash ponds were developed on alluvial bottomlands next to the Missouri River. The Terracon report relates that the <u>Soil Survey of Pottawattamie County, Iowa</u> indicates the mapped soil type (applicable to relatively shallow depths in the profile, typically 6 feet or less) in the area is Albaton Silty Clay, which formed on clayey alluvium, is poorly drained, is occasionally flooded, and has a seasonally high water table depth of 0 to 12 inches. From the test boring data in the Terracon report, the virgin site soils underlying the dike embankments consist of cohesive soils underlain by granular soils. The cohesive soils consist of very stiff to very soft fat clays and the underlying granular soils consist of loose to dense silty fine sands. Potential critical conditions often associated with cohesive alluvial soils are high compressibility and low shear strength, particularly if they are geologically recent deposits. Fat clays also have high shrink-swell potential related to changes in moisture content. Potential critical conditions often associated with alluvial sands are loose or very loose relative densities and the potential for liquefaction and, with respect to impounding structures, high permeability and the potential for excessive underseepage or high exit gradients. The shear strength (stability) issues are addressed in Terracon's engineering analyses, as previously discussed, but underseepage and liquefaction potential issues have not been addressed.

Seismicity – The site of the ash basins is in an area of relatively low seismic hazard. Based on USGS Seismic-Hazard Maps for Central and Eastern United States, dated 2008, the WSEC, including both the North Ash Pond and the South Ash Pond, is located in an area anticipated to experience about 0.05g peak ground acceleration with a 2-percent probability of exceedance in 50 years.

7.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

The furnished supporting technical documentation for structural stability is generally adequate for the purposes of this assessment with respect to global stability under static and seismic (pseudo-static) loading conditions. The methods used in the slope stability analyses are acceptable for these dikes. Material properties and parameters and other assumptions used in the analyses appear to be reasonable.

Underseepage and liquefaction potential were not addressed in the furnished supporting technical documentation. The potential for high uplift pressures at the levee/dike embankment toes due to underseepage is a concern where the clay foundation layer is relatively thin, as occurs at the explored embankment sections around the North Ash Pond and as may occur at unexplored embankment sections around the South Ash Pond, particularly near Pony Creek. The presence of "underseepage wells" on the inside toe of the Mosquito Creek levee at the southwest corner of the North Ash Pond suggests that there was a past concern (perhaps by the USACE) about uplift pressures during flooding in the creek; the wells were likely installed to relieve the temporary uplift pressures during flooding and prevent or minimize the chance of a "blowout" occurring. Therefore there is a need for documented underseepage analyses to demonstrate that the levees/dikes impounding the ash ponds have adequate safety in this respect. This underseepage issue is more critical for the embankments that serve as flood protection levees along Pony Creek and Mosquito Creek. It is presumed that the recent geotechnical study completed for the USACE/P&M Levee District includes such analyses. If the underseepage analyses in that study used analysis sections similar to or more conservative than the dike embankment sections on the other sides of the ash ponds, MidAmerican may adopt those documented analyses as being representative of the dike sections under their responsibility. Otherwise, MidAmerican should conduct underseepage analyses for those dikes to document that the dikes will be safe against seepage uplift at the outside toe under extreme pool levels in the ash ponds.

Less critical is the need for liquefaction analysis. Although the underlying silty sands do not appear to be highly susceptible to liquefaction, particularly under the relatively low earthquake intensities expected in the region, at least simple analyses using empirical methods should be performed to document that liquefaction is not a significant threat to the performance of the impounding dikes.

The reason for the very low dike embankment section on the south part of the perimeter dike on the east side of the South Ash Pond is currently unknown. In the absence of documentation (e.g., as-built notes, construction reports, etc.) of the reason for the low section of the dike, a documented investigation should be made of the compressibility (primary and secondary consolidation characteristics) of the underlying thick very soft fat clay layer and its effect on the performance of the dike embankment. The effect of design earthquake shaking on the very soft clay layer is a potential issue that should also be evaluated.

7.3 ASSESSMENT OF STRUCTURAL STABILITY

Based on visual observations and review of the Terracon's Geotechnical Engineering Report, the structural stability of the perimeter dikes impounding the ash ponds appears adequate with respect to global stability under static and seismic (pseudo-static) loading conditions. The slough that was observed on the outside slope of the levee on the north side of the South Ash Pond appears to have been caused by loss of toe support due to erosion during flood flows in Pony Creek and not due to inherent instability of the levee section. The safety of the dike/levee embankments around both ponds with respect to seepage uplift and liquefaction potential is undetermined and thus unknown at this time. In addition the reason for the low dike embankment section on the east side of the South Ash Pond is undetermined and unknown at this time. Additional study is needed or documentation is needed to assess these issues.

The visible parts of outlet structure at the North Ash Pond appeared to be in sound and stable condition with no visual evidence of significant deterioration, except at the discharge end of the outlet pipe, including end wall and flap gate, which apparently were damaged during straightening/dredging operations in Pony Creek. The damaged end of the outlet structure should be repaired to assure continued satisfactory service.

From MidAmerican it is understood that the USACE has indicated that fixing various issues in the area of the Pony Creek improvement project, including repair of the discharge end of the outlet pipe and repair of the slough on the outside slope of the levee on the north side of the South Ash Pond, will have started in late October 2010, before issue of this assessment report.

8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

8.1 OPERATIONAL PROCEDURES

North Ash Pond – This basin is currently used for storage and disposal primarily of bottom ash (including boiler slag), which is sluiced from boiler Units 1 and 2 into the southwest part of the basin, and mill rejects (pyrite). The channel through settled ash beyond the outfall pipe is periodically dredged to maintain an open channel to the main body of water in the eastern half of the basin. The location of the inflow is altered from time to time to achieve even distribution of settled ash in the basin. Water is discharged through the outlet structure to Pony Creek after assurance that the water meets permit requirements. Carbon dioxide (CO_2) formerly was infused with the water at the inlet chamber to adjust pH prior to discharge; however, this practice was discontinued, apparently because the pH levels naturally remained within discharge limits.

As previously described, fly ash formerly was sluiced into the North Ash Pond until December 31, 2007. All fly ash now is captured in silos; some goes to market and the remainder goes to an ash monofill (landfill). The fly ash deposited in the basin was hydrated and solidified into thin cemented layers, resembling shale rock, called C-stone. The surface of the solidified fly ash in the western half of the basin, which is well above the normal water level in the eastern half, is generally surfaced with gravel and sometimes used as a lay-down area for storage of equipment and materials and as a stockpile area for earth materials during construction projects. Current on-going operations also include mining the solidified fly ash (C-stone), which is stockpiled in windrows before being moved off-site for beneficial use; its main use is for stabilizing weak subgrades in road construction. MidAmerican indicated that the ash material is tested for arsenic before being used for beneficial purposes.

The sluice water is impounded in the eastern half of the basin and its level can be regulated when needed with the discharge structure located through the perimeter dike on the south side near the east end. However, since the basin is incised, the normal water level is lower than the typical toe elevation outside the perimeter dike. The area of the basin on the west side of the SIRE railroad embankment across the western part of the basin is not used for ash placement.

South Ash Pond – This basin has always been used for storage and disposal primarily of bottom ash (including boiler slag), which is sluiced from boiler Unit 3 into the western side of the basin, and mill rejects; the basin has never received fly ash. Plant drainage and pH-adjusted process water from the demineralization system are also discharged into this basin. The channel through settled ash beyond the outfall pipes is periodically dredged to maintain an open channel to the main body of water in the basin, and the location of the inflow is altered from time to time for even distribution of the settled ash. As previously described, there is no outlet structure for the South Ash Pond; the water in the basin is pumped and re-circulated to the plant for reuse in quenching and sluicing bottom ash from Unit 3. In the past, prior to construction of the SIRE railroad embankment across the western part of the basin, settled ash in the northwest part of the basin was surfaced with gravel and used for parking of automobiles and light trucks. The area of the basin on the west side of the SIRE railroad embankment across the western part of this basin also is not used for ash placement.

Least Tern and Piping Plover Conservation Management Plan – The least tern, which is listed as an endangered species, and the Great Plains piping plover, which is listed as a threatened species, have been observed for many years to use the barren surface areas at both surface impoundments at the WSEC as nesting grounds. These MidAmerican ash basins in Pottawattamie County and those at the MidAmerican Neal Energy Center in Woodbury County are the only known breeding locations for these two listed species in the state of Iowa. At the recommendation of the U.S. Fish and Wildlife Service (USFWS), MidAmerican has recently (April 2010) developed and implemented a Least Tern and Piping Plover Conservation Management Plan; a copy of the plan is included in Appendix E for reference. The plan includes an education program for WSEC employees and contractors and land management strategies, which will have some impact on operations in the basin areas during the nesting period, taken as April 1 to August 15 in accordance with the USFWS recommendation. Prior to commencing activities such as dredging along the ash sluice line discharge area at the South Ash Pond and C-stone mining at the North Ash Pond during the nesting period, point count surveys are to be completed to determine if the proposed work will impact the listed species´ nest locations and create boundary limits for the operational activities. According to the plan, the C-stone stockpile is to be maintained but no additional material is to be added to it. Long term the mined C-stone will be hauled to a stockpile location away from the North Ash Pond, so that the material can be sold year round.

8.2 MAINTENANCE OF THE DAM AND PROJECT FACILITIES

The south side dike of the North Ash Pond and the north side dike of the South Ash Pond are parts of the Pony Creek flood-control levee system, which is controlled and maintained by the Pottawattamie and Mills Counties Levee District. The west side dike of the North Ash Pond is part of the Mosquito Creek flood-control levee system, which is controlled and maintained by the Council Bluffs Levee District. MidAmerican maintains the remaining dikes that enclose the ash ponds as needed. As previously described, there is a slough (slope failure) on the outside slope of the dike (levee) on the north side of the South Ash Pond that appeared to have been caused by toe erosion during recent flooding in Pony Creek. Apparent temporary alteration in the Pony Creek alignment during the USACE on-going stream straightening/dredging project appeared to have allowed the stream to more directly impinge the embankment toe at the location of the slough. It is understood from MidAmerican personnel that the USACE is planning to repair the slope after the water in Pony Creek returns to normal level.

It appeared that the perimeter dikes receive basic maintenance to generally keep trees and woody vegetation off the dike embankments. There was evidence in several locations, commonly in outside toe areas next to the I-29 drainage swale, where small to medium-sized trees had been recently removed. However, it appeared that the outside slope of the dike on the north side of the North Ash Pond has received no maintenance to remove trees and woody vegetation and, as a consequence, a few large trees, some small trees and bushes, and tall weeds have become established on the outside slope and toe of the dike embankment; it is noted that this outside slope is outside the fenced boundary of MidAmerican property and a gravel-surfaced road at the base of the slope is a private road.

Grass on the crest and uppermost part of the embankment slopes of the perimeter dike system around the North Ash Pond had recently been mowed, as well as grass on the crest and uppermost part of the dike embankment of the north side of the South Ash Pond, and next to the gravel-surfaced crest of the dike embankment on the east side of the South Ash Pond. Bromegrass typically covers the embankments, although wild sunflowers have taken over in some areas. The bromegrass is a sod-forming grass that is thick and appears to have good resistance to erosion. The bromegrass grows 15 to 30 inches high. MidAmerican´s practice has been to allow the bromegrass to grow to maturity un-mowed on the embankment slopes, to enhance protection against surface runoff erosion.

The ash pond perimeter dikes are generally free of erosion. However, at the South Ash Pond the inside slope of the dike embankment on the east side near the north end is eroded along the waterline, apparently due to wave action when strong winds blow from the northwest. At the North Ash Pond wave erosion also occurs in the dike embankment in a similar position along the waterline; the inside slope of the dike embankment on the north side near the east end is steep just above the waterline, apparently due to past wave erosion, but it has a thick cover of bromegrass. MidAmerican staff indicated that there are plans to place riprap armor along the eroded section of embankment at the South Ash Pond. In addition there is a small erosion gully that has formed adjacent to the outside slope of the dike on the north side of the North Ash Pond, near the railroad spur close to northwest corner. This gully appears to have resulted from concentrated runoff flowing over the dike.

The visible parts of the outlet works at the North Ash Pond appeared to be in good repair, except for the detached section of pipe, end wall, and flap gate at the discharge end of the outlet pipe. Also, the overflow structure at the inlet end of the outlet pipe appeared to contain a lot of gravel-sized flat pieces of C-stone that have eroded into the structure. Approximate measurements in the field indicate that the level of this “sediment” may be within about one foot of the bottom of the skimmer wall, leaving an opening of only 1 foot. The design opening beneath the skimmer wall is 3 feet; therefore it appears that 2 feet of sediment has accumulated under the skimmer wall. The consequences of complete blockage of the opening under the skimmer wall would be that water would have to build to just above elevation 970 feet to overtop the sidewalls of the structure to reach the inlet chamber and the benefit of the skimmer wall would be lost.

8.3 ASSESSMENT OF MAINTENANCE AND METHODS OF OPERATION

8.3.1 Adequacy of Operational Procedures

Operational procedures at both the North Ash Pond and the South Ash Pond appear to be appropriate and adequate.

8.3.2 Adequacy of Maintenance

The slump on the levee (outside slope of dike on north side of South ash Pond) and damaged end of outlet pipe from the North Ash Pond are significant repair issues that are to be addressed by the USACE. Maintenance of the impounding embankments of both the North Ash Pond and the South Ash Pond and the North Ash Pond outlet works appears to be generally adequate. However, in addition to routine maintenance, there are maintenance issues listed below that should be addressed by MidAmerican:

- Allowing the bromegrass to grow to maturity on the embankment slopes appears to have an advantage (good erosion resistance) that outweighs the disadvantage (some hindrance to visual observations for problem conditions), particularly since it does not appear to grow to great height. However, tall vegetation like sunflowers, goldenrod, and other stalky weeds should preferably be eradicated or controlled by cutting two or three times during the growing season.
- Woody vegetation on the outside slope of the dike on the north side of the North Ash Pond is undesirable. If possible, small trees and bushes should be removed before they become large. (This may require negotiating an agreement with the adjacent land owner to gain access to the outside slope.) At this point it probably would be best to leave the few large trees in-place, since cutting them now would initiate decay of root systems that may extend far into the embankment. However, because the outside toe elevation is generally higher than the normal water level in the pond and not much below the maximum water level in the pond, there appears to be no significant threat of seepage occurring along decayed root systems at normal water level and probably not much threat during maximum water level. The threat would be more significant if extreme water levels approaching the top elevation of the perimeter dike were to occur.
- Consideration should be given to placing riprap protection on the eroded inside slope of the North Ash Pond along the waterline on the east side near north end, when planned riprap repairs at the South Ash Pond are done. The dike embankment on the north side of the North Ash Pond where the inside slope is very steep just above waterline should be closely observed in future inspections to check for tension cracks, slide scarps or other signs of mass soil movement.

- The sediment in the overflow structure should be cleaned out and maintained clear in the future to assure that the opening under the skimmer wall is not blocked.
- The small erosion gully that has formed adjacent to the outside slope of the dike on the north side of the North Ash Pond, near the railroad spur close to northwest corner, should be repaired as part of routine maintenance.

9.0 SURVEILLANCE AND MONITORING PROGRAM

9.1 SURVEILLANCE PROCEDURES

The MidAmerican WSEC does not have a formal program of inspections of the perimeter dikes around the ash ponds or the outlet structure at the North Ash Pond, other than to have plant operating personnel make drive-around inspections once per quarter to check the condition of the dike embankments and outlet works; these inspections have not been documented with a checklist or report. Informal observations of conditions in and around the ash ponds are made by both operating and security personnel during the course of daily operations.

Some level of surveillance of the perimeter dikes that serve as flood-control levees along Pony Creek and Mosquito Creek presumably is conducted under the purview of the Pottawattamie and Lee Counties Levee District (for Pony Creek) and the Council Bluffs Levee District (for Mosquito Creek).

9.2 INSTRUMENTATION MONITORING

9.2.1 Instrumentation Plan

There is no permanent dam performance monitoring instrumentation in place in the impounding embankments of the North Ash Pond and the South Ash Pond. MidAmerican has placed temporary steel pins (rebar) at intervals in the ground surface back of the slough on the outside slope of the dike on the north side of the South Ash Pond to provide a means of monitoring any progression of backward sloughing until the slope can be repaired by the USACE. Groundwater monitoring wells have been installed at various locations around the basins for compliance monitoring of groundwater quality.

9.2.2 Instrumentation Monitoring Results

There are no permanent dam performance monitoring instruments and, thus, no results of dam monitoring. Visual monitoring of the temporary steel pins behind the slough by WSEC personnel has indicated that there was some additional backward sloughing soon after the initial slough occurred, but its progression has diminished, and the sloughing does not currently threaten a breach of the dike. WSEC personnel plan to continue monitoring the pins until the slope is repaired.

9.2.3 Dam Performance Data Evaluation

Not applicable, since there are no permanent dam performance instruments. WSEC´s monitoring of the temporary steel pins behind the slough until the slope is repaired is an appropriate precaution. In-depth evaluation of groundwater quality monitoring results is beyond the scope of this structural/stability assessment.

9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

9.3.1 Adequacy of Inspection Program

The inspection program is substandard. A formal inspection program should be developed and implemented. At a minimum the inspection program should include:

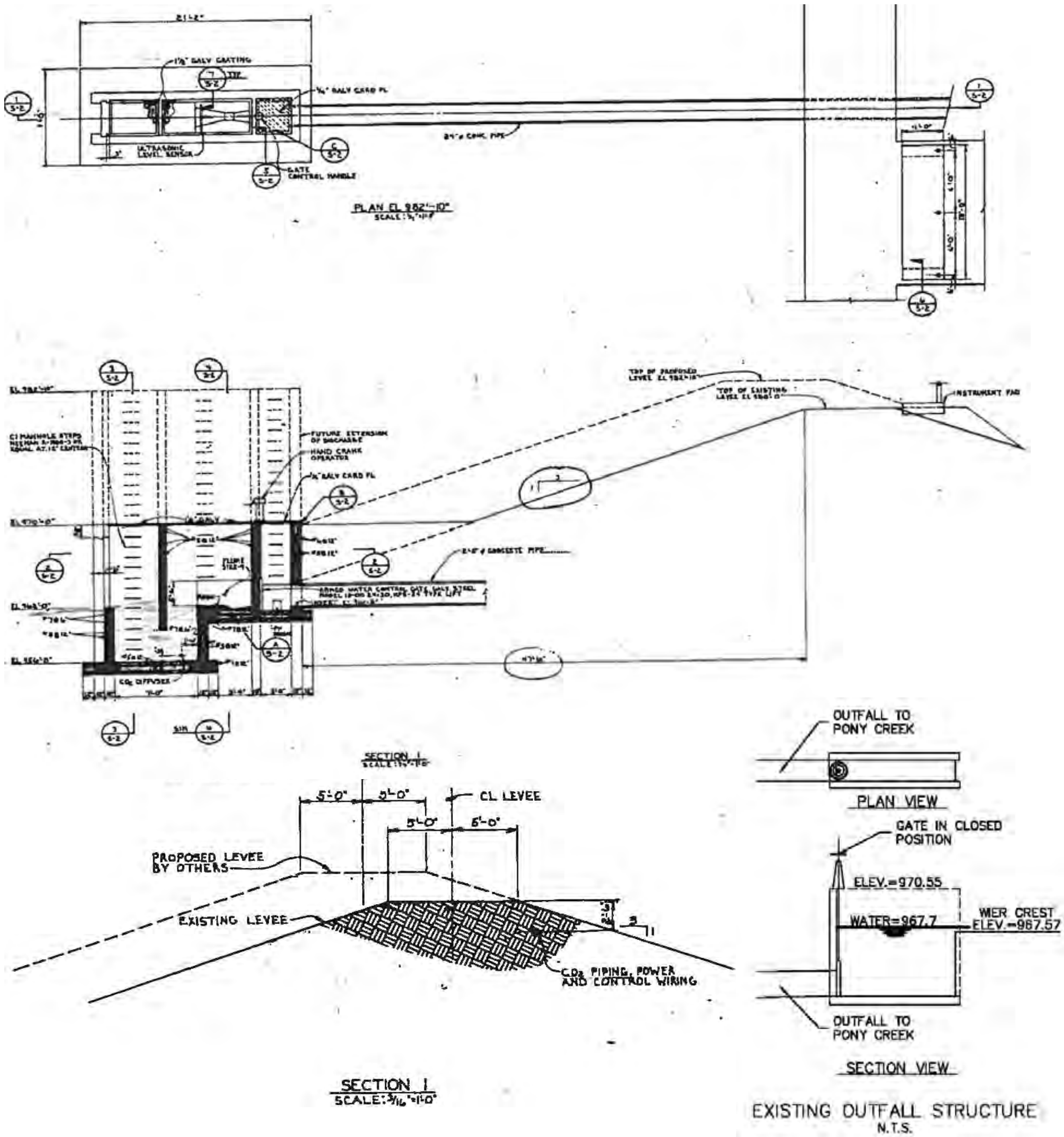
- Quarterly inspections performed by plant operating personnel familiar with the dike embankments and trained on what to look for in the field. The quarterly inspections should be documented; use of a checklist form is suggested.
- Annual inspections performed by an engineer familiar with the dike embankments and associated engineering data. The annual inspections should be documented with a written inspection report, or checklist form, including evaluation and recommendations.
- Internal inspections of the outlet structure should be conducted every 5 years with a remote camera or by personnel using confined-space entry procedures. The results should be documented with a written inspection report.

9.3.2 Adequacy of Instrumentation Monitoring Program

There is no permanent dam performance monitoring instrumentation in place at either ash pond perimeter dike. No significant problem or suspect condition, such as recent excessive settlement, seepage, shear failure (other than the slough with known cause), or displacement was observed in the field that might be reason for installation of permanent instrumentation. In the absence of stability problems or seepage issues, there is no need for permanent performance monitoring instrumentation at this time.

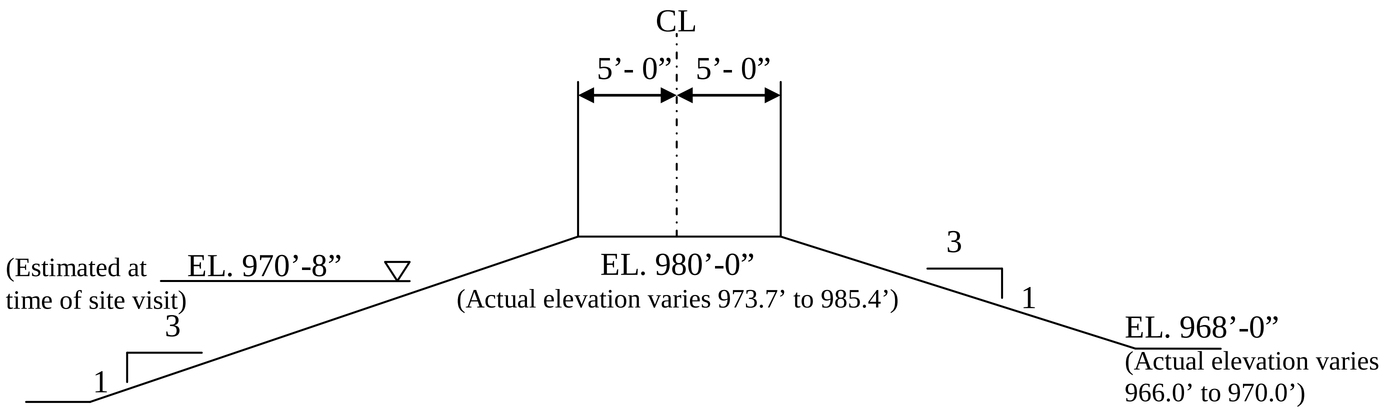
DRAFT

EXHIBIT 1: REPRESENTATIVE SECTION OF NORTH ASH POND LEVEE EMBANKMENT (South Side at Outlet Works)



DRAFT

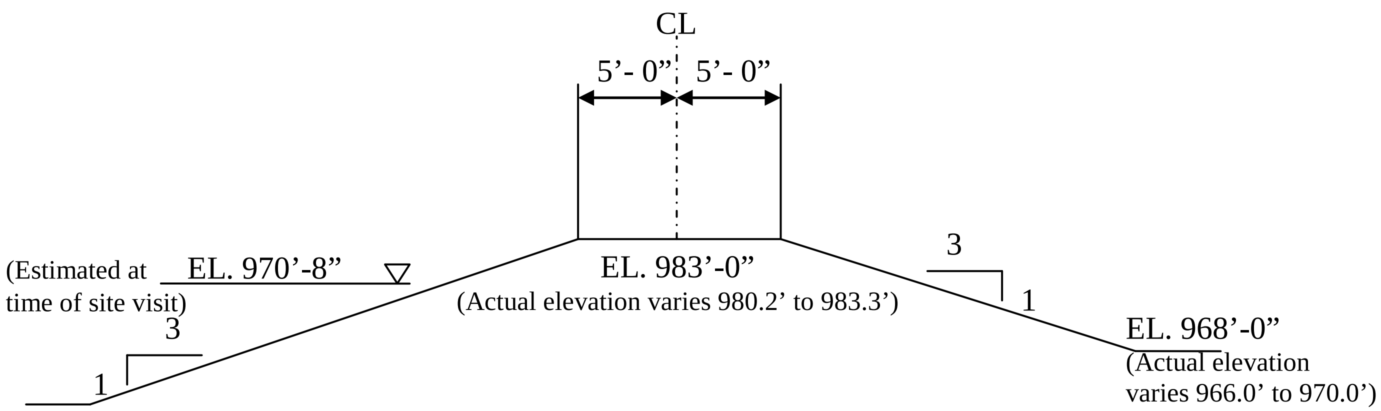
EXHIBIT 2: REPRESENTATIVE SECTION OF SOUTH ASH POND EMBANKMENTS



TYPICAL SECTION

NOT TO SCALE

REPRESENTATIVE SECTION OF IMPOUNDMENT EMBANKMENT EXCLUDING NORTH SIDE EMBANKMENT



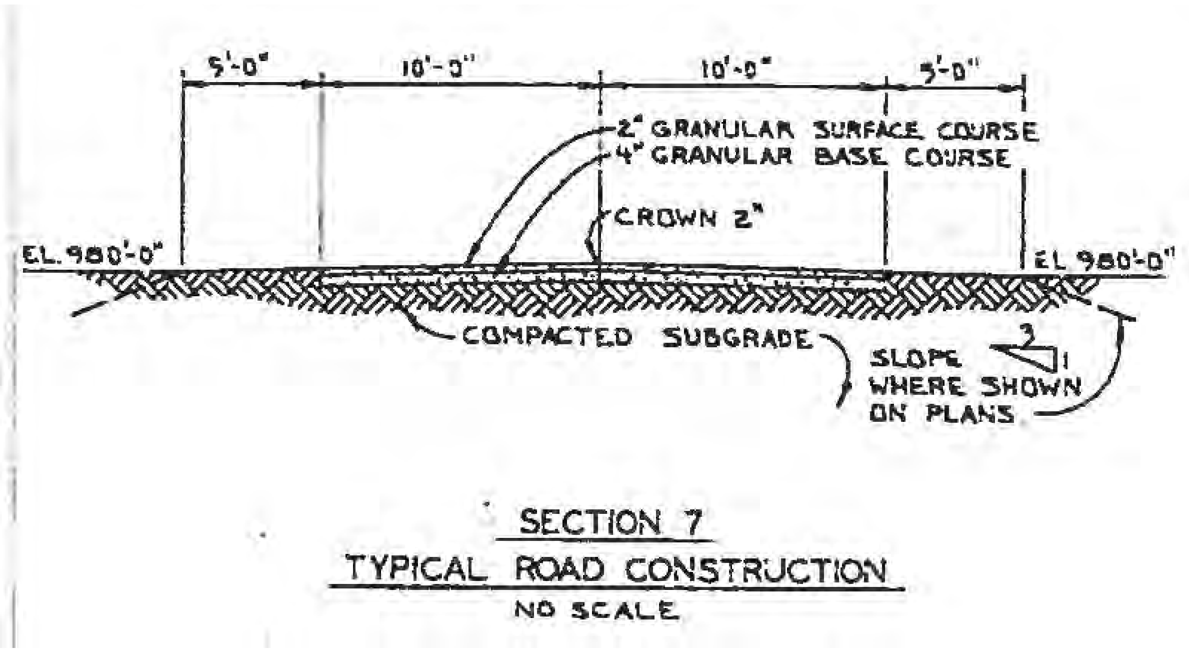
TYPICAL SECTION

NOT TO SCALE

REPRESENTATIVE SECTION OF NORTH SIDE EMBANKMENT

DRAFT

EXHIBIT 3: REPRESENTATIVE DESIGN SECTION OF 189th STREET



APPENDIX A

SITE VISIT PHOTOS

Walter Scott Jr. Energy Center
Photograph Index Map

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Photo N.1
North Pond dike outside slope (W side viewed S)

Photo N.2
North Pond dike outside slope (W side viewed N)

Photo N.3
North Pond Mosquito Creek dike outside toe area
(W side viewed S)

Photo N.4
North Pond Mosquito Creek dike outside toe area
(W side viewed N)

Photo N.5
North Pond (viewed SE)

Photo N.6
North Pond (viewed E)

Photo N.7
North Pond (viewed NE)

Photo N.8
North Pond (viewed N)
-concrete access road in the foreground

Photo N.9
North Pond   Water edge fly ash deposits

Photo N.10
North Pond end of discharge area (viewed S)

Photo N.11
North Pond dike crest (N side viewed E)

Photo N.12
North Pond dike inside slope and crest (N side viewed W)

Photo N.13
North Pond dike crest (W side viewed S)

Photo N.14
North Pond dike outside slope (W side viewed S)

Photo N.15
North Pond dike outside slope (N side viewed E)

Photo N.16
North Pond dike outside toe area (N side viewed W)
-dike to left, past RR tracks

Photo N.17
North Pond dike outside slope (N side viewed S) -erosion

Photo N.18
North Pond dike outside slope (N side viewed E)

Photo N.19
North Pond dike outside slope (N side viewed W)

Photo N.20
North Pond dike outside slope (N side viewed SE)

Photo N.21
North Pond dike outside slope (N side viewed SE)

Photo N.22
North Pond dike outside slope (N side viewed SE)

Photo N.23
North Pond dike outside slope (N side viewed W)

Photo N.24
North Pond dike outside slope and toe area (NE corner viewed NE)

Photo N.25
North Pond dike inside slope (E corner viewed S)

Photo N.26
North Pond dike crest and outside slope (E side viewed S)

Photo N.27
North Pond dike inside slope (E side viewed S)

Photo N.28
North Pond dike outside slope and toe area (E side viewed E)

Photo N.29
North Pond dike outside slope at toe (E side viewed N)

Photo N.30
North Pond dike outside slope and toe (E side viewed N)

Photo N.31
North Pond dike outside slope & toe (E side viewed S)
-low point for I-29 drainage ditch, note thick vegetation

Photo N.32
North Pond dike crest & inside slope (E side viewed S)
-note higher dike on south side

Photo N.33
North Pond dike inside slope (S side viewed SW) –overflow structure

Photo N.34
North Pond dike crest and inside slope E side viewed N)

Photo N.35
North Pond dike outside slope (E side viewed N)

Photo N.36
North Pond dike inside slope (E side viewed N)

Photo N.37
North Pond dike inside slope (S side viewed W) –note riprap

Photo N.38
North Pond dike crest (E side viewed N)

Photo N.39
North Pond dike outside slope and crest (S side viewed W)

Photo N.40
North Pond dike crest and inside slope (S side viewed W)

Photo N.41
North Pond dike outside slope and crest (S side viewed E)

Photo N.42
North Pond dike outside slope and swale (E side viewed N) –Pony Creek

Photo N.43
North Pond dike outside slope and crest (S side viewed E)
-Pony Creek

Photo N.44
North Pond dike inside slope of RR embankment
(W side viewed N)

Photo N.45
North Pond (viewed E) -inflow to North Pond

Photo N.45.b
North Pond (viewed E) -inflow pipe (sluice line)

Photo N.45.c
North Pond inflow pipe discharge

Photo N.45.d
North Pond (viewed E) –ditch inflow of ash

Photo N.46
North Pond dike outside slope (W side viewed N)

Photo N.47
North Pond dike crest and inside slope (W side viewed N)

Photo N.48
North Pond dike inside slope (W side viewed S)

Photo N.49
North Pond dike crest and inside slope (W side viewed S)

Photo S.1
South Pond bottom fly ash excavated area (viewed E)

Photo S.1.a
South Pond (from near top of mound) (viewed NE)

Photo S.2
South Pond RR dike crest (W side viewed S)
-west side noted by dotted yellow line

Photo S.3
South Pond Inflow to pond (viewed E)

Photo S.4
South Pond RR dike and inflow pipes (viewed W)

Photo S.5
South Pond dike inside slope (yellow line) (W side viewed S)

Photo S.6
South Pond dike inside slope (W side viewed W)
-pump structure

Photo S.7
South Pond pond area (N side viewed NE)

Photo S.8
South Pond dike inside slope (N side viewed E)

Photo S.9
South Pond dike crest (N side viewed E)

Photo S.10
South Pond dike outside slope toe area (N side viewed NW)
-at RR Bridge

Photo S.11
South Pond dike inside slope and crest (N side viewed W)

Photo S.12
South Pond dike outside slope (N side viewed W) –Pony Creek

Photo S.13
South Pond dike crest and outside slope (E side viewed S)

Photo S.14
South Pond dike outside slope (N side viewed S)
-note slough

Photo S.15
South Pond dike outside slope (N side viewed S)
-note slide scarp

Photo S.16 (N side viewed NE)
South Pond dike outside slope toe and Pony Creek –note erosion

Photo S.17 (viewed S)
South Pond dike outside slope and toe –drainage structure

Photo S.18
South Pond dike crest and outside slope (E Side viewed S)

Photo S.19
South Pond dike inside slope and crest (E side viewed N)
-note dip in crest (low section)

Photo S.20
South Pond dike inside slope (SE corner viewed SW)

Photo S.21
South Pond dike outside slope and crest (E side viewed N)

Photo S.22
South Pond dike crest & inside slope (S side viewed W)

Photo S.23
South Pond dike inside slope (S side viewed W)

Photo S.24
South Pond dike outside slope (S side viewed E)

Photo S.25
South Pond dike inside slope (S side viewed E)

Photo S.26
South Pond RR dike inside slope (W side viewed N)

Photo S.27
South Pond dike inside slope (W side viewed N)

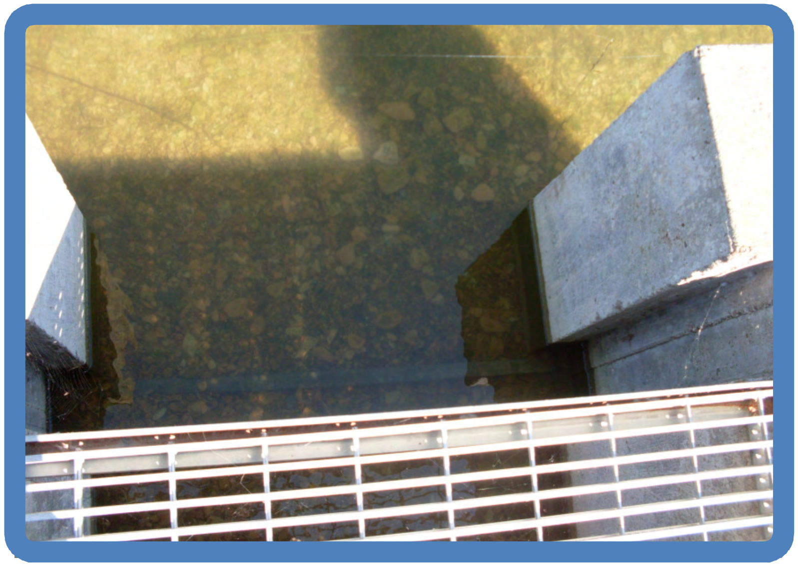


Photo O.1
North Pond Overflow Structure weir -note C-stone sediment

Photo O.2
North Pond Outfall Structure Inside Box

Photo O.3
Pony Creek levee outide slope South Pond (N side viewed W)

Photo O.4
Pony Creek Enlarged Photo of broken End Section Outfall Pipe

APPENDIX B

FIELD OBSERVATION CHECKLISTS

APPENDIX B

NORTH SURFACE IMPOUNDMENT FIELD OBSERVATION CHECKLIST

Site Name:	**Walter Scott Energy Center**	**Date:**	**September 15, 2010**
Unit Name:	**North Pond**	**Operator's Name:**	**MidAmerican Energy Company**
Unit I.D.:		**Hazard Potential Classification:**	**High** ☐ **Significant** ☐ **Low** ☒
	Inspector's Name:	Frederic C. Tucker and Mark Hoskins	

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Quarterly[1]		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	967.5[2]		19. Major erosion or slope deterioration?		X[7]
3. Decant inlet elevation (operator records)?	967[3]		20. **Decant Pipes**:		
4. Open channel spillway elevation (operator records)?		n/a	Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	979.2[4]		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?		n/a	Is water exiting outlet flowing clear?		X[8]
7. Is the embankment currently under construction?		X	21. **Seepage** (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?		n/a	From underdrain?		n/a
9. Trees growing on embankment? (If so, indicate largest diameter below)	X[5]		At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?		n/a	From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?	X[6]		23. Water against downstream toe?	X[9]	
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Issue #	Comments
	n/a – not applicable or not a feature
1	Mid American conducts internal inspections and informal daily inspections over the course of the year by plant and security personnel.
2	Record rains have increased the pond elevation. This is also due to increased elevations of Pony Creek the discharge water body for the North Pond. Normal elevation may be more near 965.5.
3	Outfall structure has adjustable stop logs to elevation 962.
4	From the provided 1974 construction plans the eastern berm is at 980. The west side of the north pond low portion is at elevation 979.2.

Issue #	Comments
5	Several trees (12-15" diameter) on the north side embankment. Off the MidAmerican property, negotiating with property owner
6	The outfall concrete box has gravel in the front portion that needs to be shoveled out. The structure looks in good condition overall. The outfall section of pipe will be replaced as the US Army Corps will complete their dredging of Pony Creek. The end pip section has been placed up on the Pony Creek bank.
7	In the northeast corner of the pond there is some minor bank erosion from wave action within the pond. Other areas need some slope regarding and vegetation. Overall the banks are in good condition.
8	There did not appear to be any flow out from the pond. The sluice gate appears to be closed.
9	The Interstate 29 roadway ditch has some water at the base of the east side of the pond. Does not appear to be seepage.

Coal Combustion Waste (CCW) **Impoundment Inspection**

Impoundment NPDES Permit 7820101 **INSPECTOR** Frederic C. Tucker and Mark Hoskins

Date of Expiration February 26, 2008
Impoundment Name Retention Pond #2 (North Pond) #006

Impoundment Company MidAmerican Energy Company
EPA Region 7

State Agency (Field Office) Address Iowa Department of Natural Resources, 401 SW 7th, Suite I
Des Moines, IA 50309
Name of Impoundment Retention Pond #2 (North Pond)

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☐ **Update** ☒

	Yes	**No**
Is impoundment currently under construction?	☐	☒
Is water or ccw currently being pumped into the impoundment?	☒	☐

IMPOUNDMENT FUNCTION: To impound fly ash, bottom ash, mill rejects and boiler slag. Other permitted impoundments include ash transport water, boiler blowdown, floor drain wastewater, stormwater runoff (immediate adjacent) ash hopper water, bearing cooler water, seal water and air conditioning cooling water

Nearest Downstream Town Name: Bellvue, Nebraska (downstream on the Missouri)

Distance from the impoundment: 2 miles

Location:

Latitude	41	Degrees	11	Minutes	7.804	Seconds	**N**
Longitude	-95	Degrees	49	Minutes	34.89	Seconds	**W**

State Iowa **County** Pottawattamie and Mills Counties

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? **Iowa Department of Natural Resources**

HAZARD POTENTIAL *(In the event the impoundment should fail, the following would occur):*

☐ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

☒ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

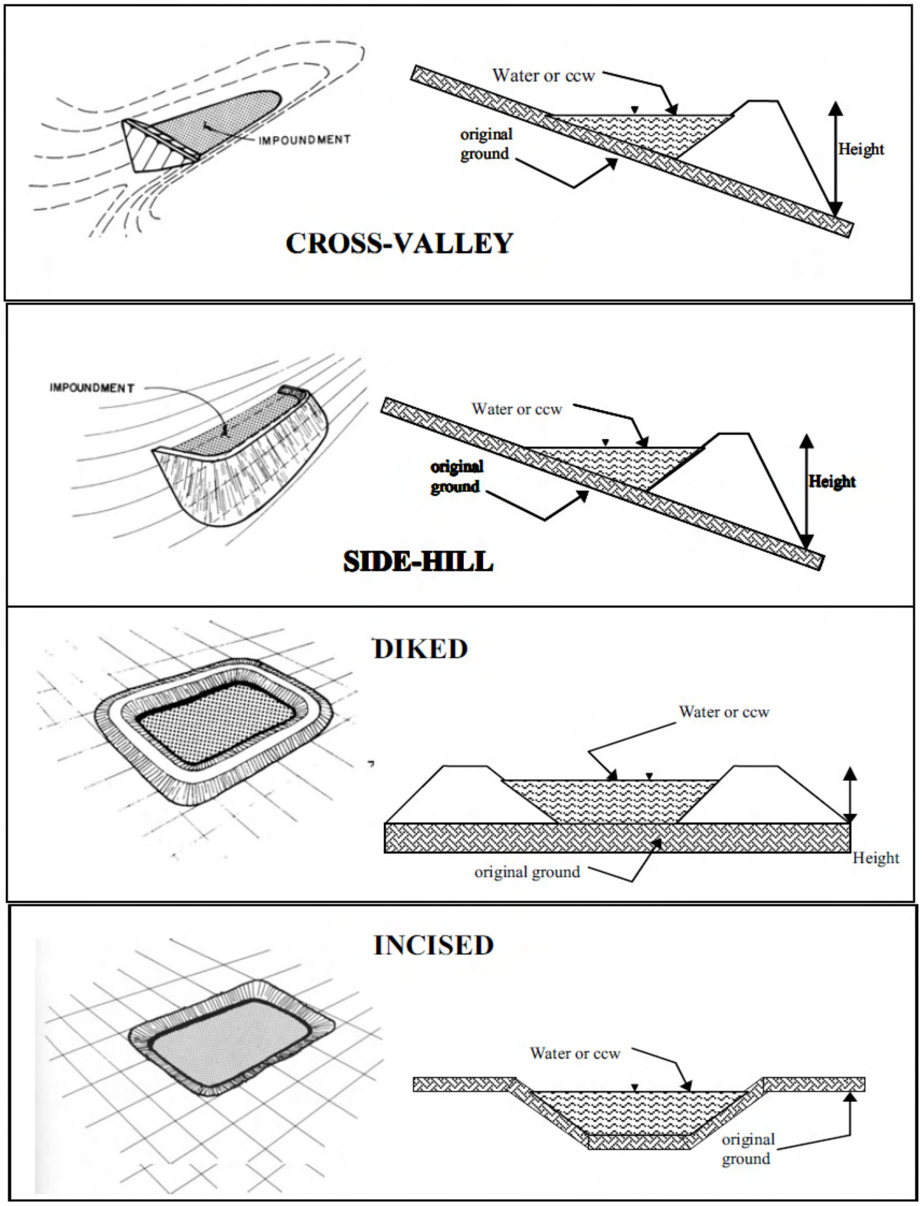
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Failure of the south berm would discharge into Pony Creek which could cause minor environmental damage. Failure of the easterly-side berm would discharge indirectly into the Interstate 80 west side swale which could discharge also eastward into several adjacent farms causing some minor economic damage and minor environmental damage.

CONFIGURATION:



☐ Cross-Valley ☐ Side-Hill ☐ Diked

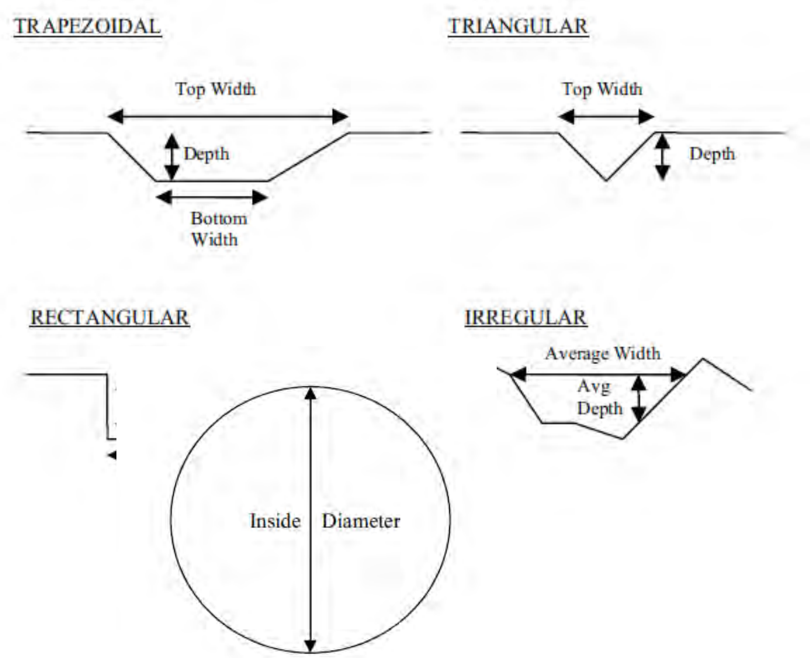
☐ Incised (form completion optional) ☒ Combination Incised/Diked

Embankment Height (ft)	Ave=15 Peak=18.2	**Embankment Material**	Slity Clay (from borings)
Pool Area (ac)	Water=71.9 Pond=171	**Liner**	None
Current Freeboard (ft)	11.7 (9-15-2010)	**Liner Permeability**	n/a

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal
☐ Triangular
☒ Rectangular Weir
☐ Irregular
depth (ft) 3 ft with stop logs
Ave. bottom width (3 FT)
top width (ft)



☒ **Outlet**

24" inside diameter
RCP

Material

☐ corrugated metal
☐ welded steel
☒ Concrete
☐ plastic (hdpe, pvc, etc.)
☐ other (specify):

	Yes	No	
Is water flowing through the outlet?	☐	☒	Gate closed

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

The Impoundment was Designed By **Black and Veatch Engineers (1974)**

	Yes	No
Has there ever been a failure at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No information provided on embankment construction.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

The dam assessor has not met with the design engineer-of-record. Provided borings show that the berms were built on natural ground.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

No significant repair was noted from the site investigation.

APPENDIX B

SOUTH SURFACE IMPOUNDMENT FIELD OBSERVATION CHECKLIST

Site Name:	**Walter Scott Energy Center**	**Date:**	**September 15, 2010**
Unit Name:	**South Pond**	**Operator's Name:**	**MidAmerican Energy Company**
Unit I.D.:		**Hazard Potential Classification:**	**High** ☐ **Significant** ☐ **Low** ☒
	Inspector's Name:	Frederic C. Tucker and Mark Hoskins	

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Quarterly[1]		18. Sloughing or bulging on slopes?	X[5]	
2. Pool elevation (operator records)?	976[2]		19. Major erosion or slope deterioration?	X[6]	
3. Decant inlet elevation (operator records)?		X[3]	20. **Decant Pipes**:		
4. Open channel spillway elevation (operator records)?		X[4]	Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	979.0[5]		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?		X	Is water exiting outlet flowing clear?		X
7. Is the embankment currently under construction?		X	21. **Seepage** (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?		X	From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?		X	From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Issue #	Comments
	n/a – not applicable or not a feature
1	Mid American conducts internal inspections and informal daily inspections over the course of the year by plant and security personnel.
2	Record rains have increased the pond elevation. Normal elevation varies depending on volume of effluent discharged into the South Pond.
3	There is no discharge structure for the south pond. The pond elevation is regulated by the removal of water by the plant and fly ash discharge inflow.
4	There is no outfall structure for the south pond.

Issue #	Comments
5	There is about 50 LF of north-side berm sloughing along Pony Creek about 1200 LF west of Interstate 29. This has resulted from US Army Corps Pony Creek dredging. The Corps will repair the sloughing after Pony Creek recedes from its present high water level.
6	There is about 600 LF of inside slope erosion due to wave action on the NE corner of the South Pond. The erosion will not cause failure of the berm

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit	7820101 (indirectly)	INSPECTOR	Frederic C. Tucker and Mark Hoskins
Date	October 16, 2006		
Impoundment Name	Retention Pond #2 (North Pond) #006		
Impoundment Company	MidAmerican Energy Company		
EPA Region	7		
State Agency (Field Office) Address	Iowa Department of Natural Resources, 401 SW 7th, Suite I Des Moines, IA 50309		
Name of Impoundment	The South Pond does not discharge into the north pond. It has no outfall.		

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☐ Update ☒

	Yes	No
Is impoundment currently under construction?	☐	☒
Is water or ccw currently being pumped into the impoundment?	☒	☐

IMPOUNDMENT FUNCTION: To impound fly ash, bottom ash, mill rejects and boiler slag. Other permitted impoundments include ash transport water, boiler blowdown, floor drain wastewater, stormwater runoff (immediate adjacent) ash hopper water, seal water and air conditioning cooling water

Nearest Downstream Town Name: Bellvue, Nebraska (downstream on the Missouri)

Distance from the impoundment: 2 miles

Location:

Latitude	41	Degrees	10	Minutes	42.69	Seconds	N
Longitude	-95	Degrees	49	Minutes	39.22	Seconds	W
State	**Iowa**			County	**Pottawattamie and Mills Counties**		

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? **Iowa Department of Natural Resources**

HAZARD POTENTIAL *(In the event the impoundment should fail, the following would occur):*

☐ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

☒ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

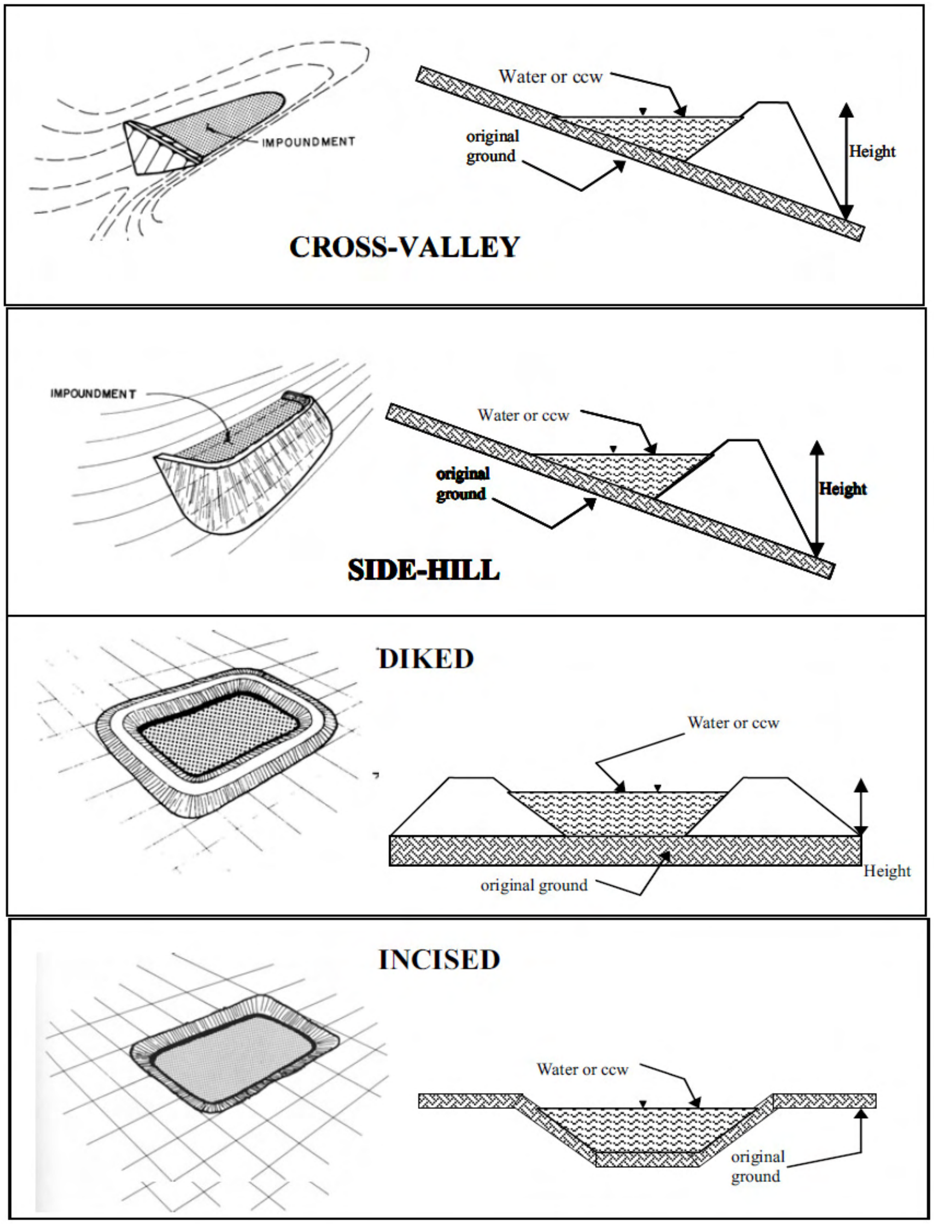
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Failure of the northerly berm would discharge into Pony Creek which could cause minor environmental damage. Failure of the west side berm would discharge indirectly into the Interstate 80 west side swale which could discharge eastward into several adjacent farms causing some economic damage and minor environmental damage.

CONFIGURATION:



☐ Cross-Valley ☐ Side-Hill ☐ Diked

☐ Incised (form completion optional) ☒ Combination Incised/Diked

Embankment Height (ft)	Ave=7 Max=16	**Embankment Material**	Slity Clay (from borings)
Pool Area (ac)	Water =88 Pond =133	**Liner**	None
Current Freeboard (ft)	3 (9-15-2010)	**Liner Permeability**	n/a

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

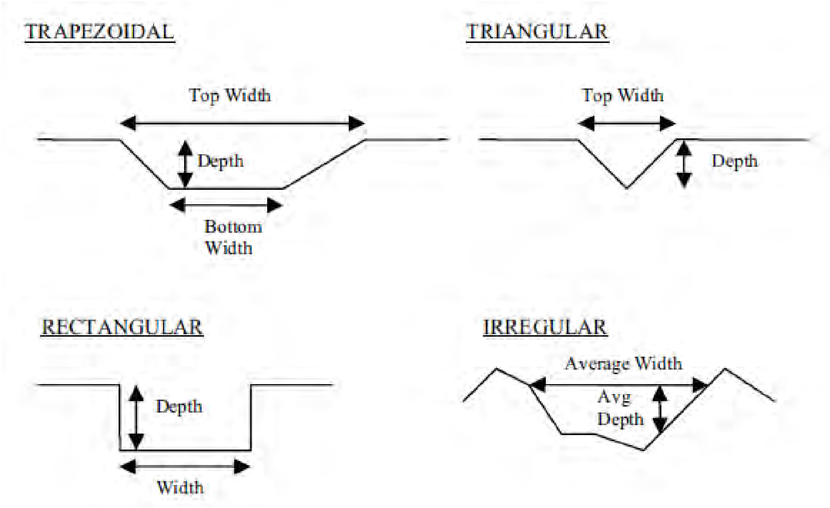
☐ Rectangular

☐ Irregular

depth (ft)

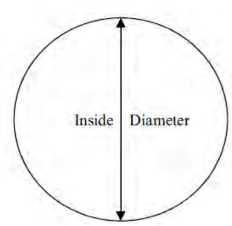
Ave. bottom width

top width (ft)



☐ **Outlet**

inside diameter



Material

☐ **corrugated metal**

☐ **welded steel**

☐ **Concrete**

☐ **plastic (hdpe, pvc, etc.)**

☐ **other (specify):**

	Yes	No
Is water flowing through the outlet?	☐	☐

☒ **No Outlet**

☐ **Other Type of Outlet** (specify):

The Impoundment was Designed By **Black and Veatch Engineers (1974)**

	Yes	No
Has there ever been a failure at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe : It appears that monitor wells were installed on the site. It is not known what type of information was collected outside the MWH report which has static water levels.

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

There is no information that implies that the berms were built on unsuitable material.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

The dam assessor has not met with the design engineer-of-record. Provided borings show that the berms were built on natural ground.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

Along the north side berm, due to recent regarding by the US Army Corps of Engineers, a 50 foot section of outside berm along Pony Creek has sloughed down. The Corps has requested that they repair the damage after Pony Creek water elevation recedes. Mid American has offered to repair and has been told to not work on the berm. There is no danger of the berm to fail.

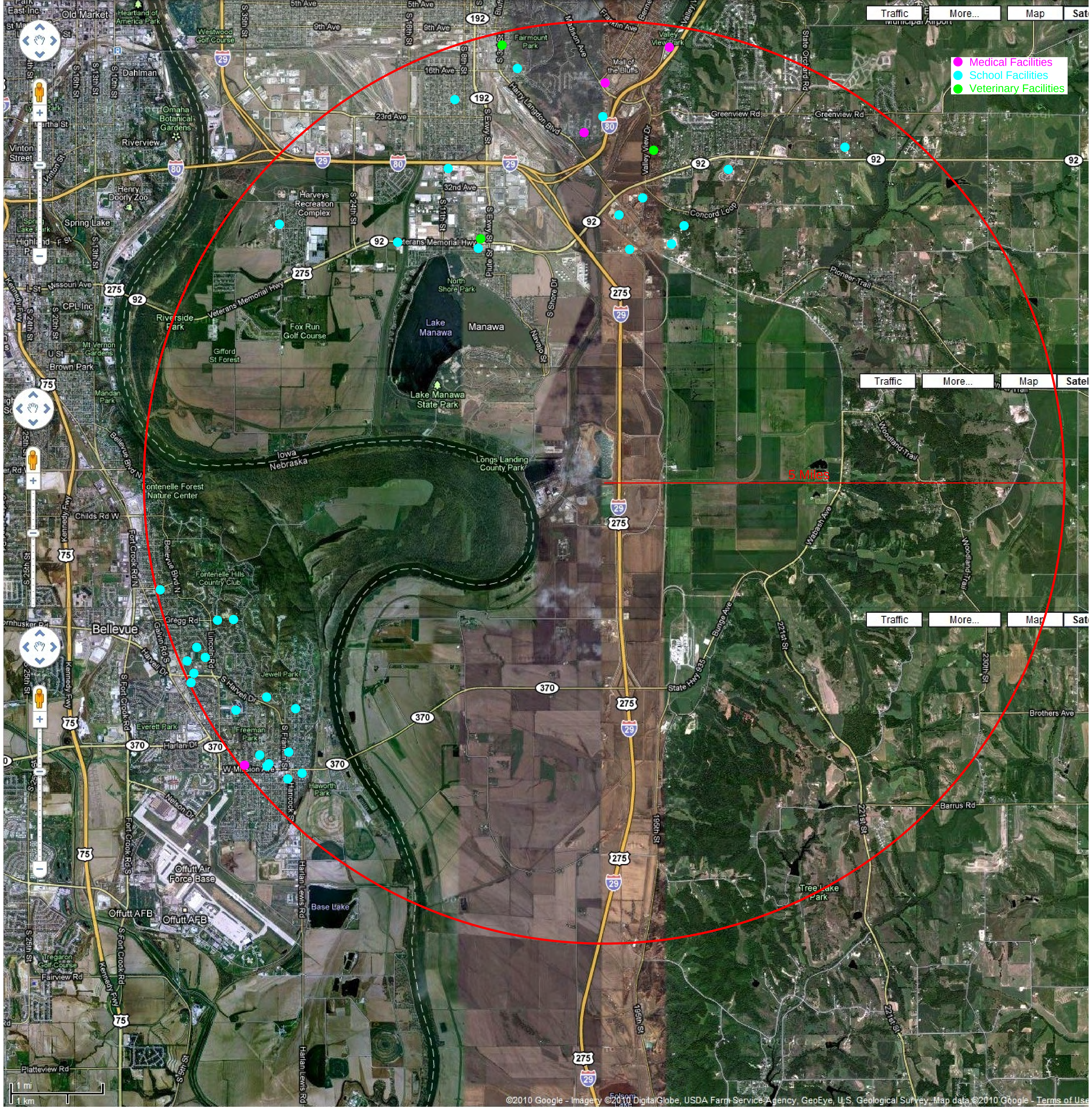
Also the rail road was placed several very crude patches along the west outside portion of the berm in about 4 locations each about 20 feet wide. There is no danger of the berm to fail.

APPENDIX C

REFERENCE DOCUMENTS

APPENDIX C

DOC 1.1 WALTER SCOTT JR. ENERGY CENTER GOOGLE MAP AERIAL


Medical Facilities
School Facilities
Veterinary Facilities
5 Miles
Lake Manawa
Manawa
Lake Manawa State Park
Iowa
Nebraska
Bellevue
Offutt Air Force Base
Offutt AFB
Base Lake
Tree Lake Park
Fontenelle Forest Nature Center
Longs Landing County Park
Harveys Recreation Complex
Fox Run Golf Course
Riverside Park
Henry Doorly Zoo
Spring Lake
Dahlman
Old Market
Riverview
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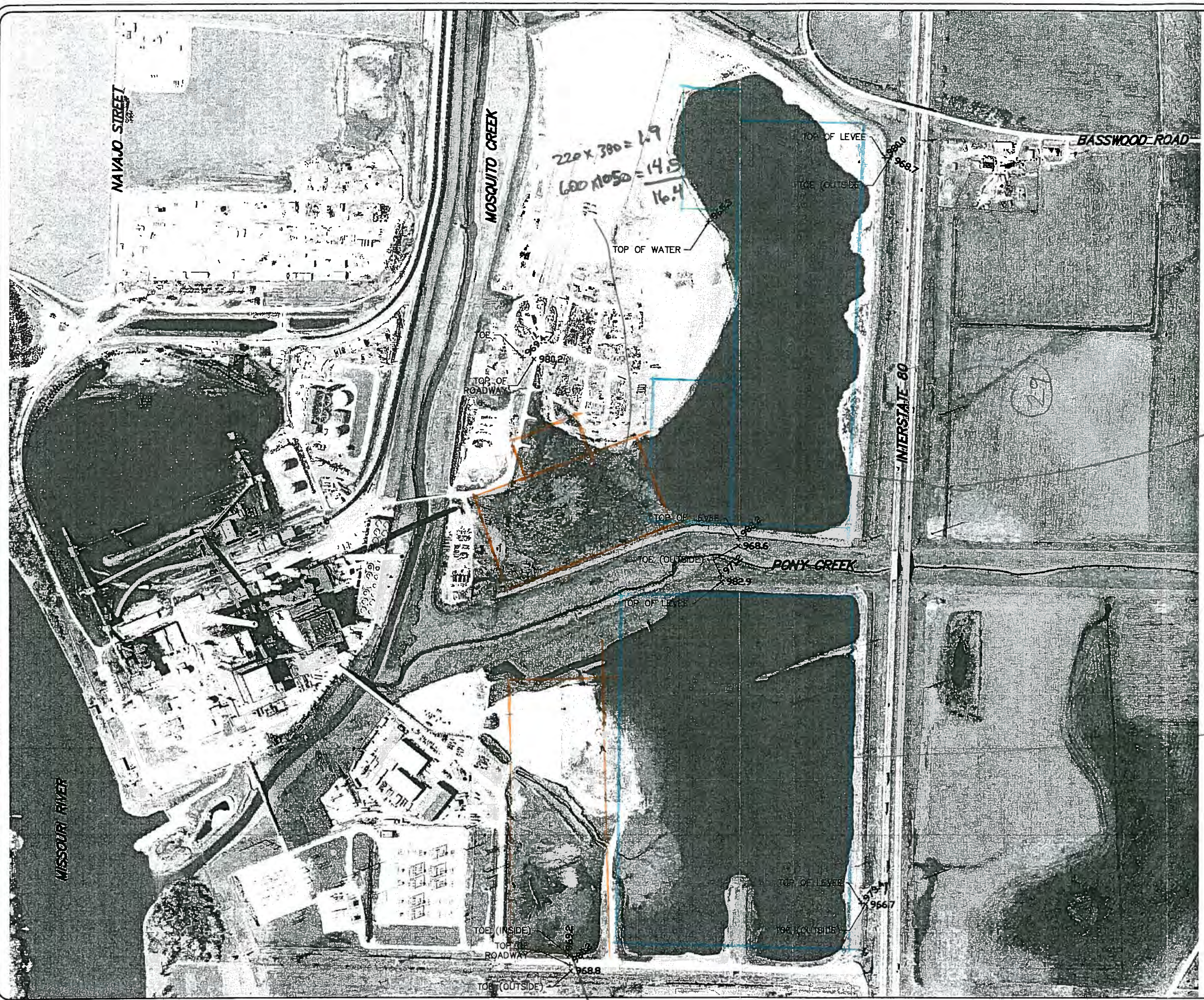
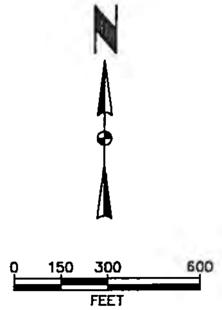
APPENDIX C

DOC 1.2 WALTER SCOTT JR. ENERGY CENTER AERIAL MAP





A 2400' x 760' = 41.9
B 450 x 820 = 8.5
C 310 x 720 = 5.1
55.5 ac
+ 16.4
71.9 ac

A 1400 x 2100 = 67.5 ac
20.5
88.0

A + B = 159.9

550 x 1630 = 20.5 ac

hgm ASSOCIATES INC.
640 FIFTH AVENUE COUNCIL BLUFFS, IOWA
PHONE: (712) 323-0530

drawn	DEF
designed	DEF
approved	MGS
date	MAR.'09
revision	date

project WALTER SCOTT ENERGY CENTER
ASH PONDS

client MIDAMERICAN ENERGY COMPANY
7215 NAVAJO STREET, COUNCIL BLUFFS, IOWA 51501

sheet **EXHIBIT**

project no. 11407

sheet 1 OF 1

APPENDIX C

DOC 1.3 FINISH GRADES PLANS

TEST HOLE NUMBER	LOCATION EAST	LOCATION SOUTH	DEPTH	UNCONFINED COMPRESSION TESTS	STANDARD PENETRATION TESTS	SLEEVE ANALYSIS	REMARKS
1	10,845	10,200	135'	NONE	AS SPECIFIED	NONE	
2	10,920	10,350	100'	NONE	AS SPECIFIED	NONE	
3	10,770	10,350	100'	NONE	AS SPECIFIED	NONE	
4	10,920	10,500	100'	NONE	AS SPECIFIED	NONE	
5	10,770	10,500	100'	NONE	AS SPECIFIED	NONE	
6	10,920	10,650	100'	NONE	AS SPECIFIED	NONE	
7	10,770	10,650	100'	NONE	AS SPECIFIED	NONE	
8	10,845	10,950	100'	NONE	AS SPECIFIED	NONE	
9	9,950	10,950	135'	NONE	AS SPECIFIED	NONE	
10	10,550	10,300	50'	NONE	AS SPECIFIED	NONE	
11	10,200	9,300	50'	NONE	AS SPECIFIED	NONE	
12	10,200	9,500	85'	NONE	AS SPECIFIED	NONE	
13	10,200	9,700	60'	NONE	AS SPECIFIED	NONE	
14	10,920	9,700	100'	NONE	AS SPECIFIED	NONE	
15	11,200	9,800	60'	NONE	AS SPECIFIED	NONE	
16	11,400	9,800	110'	NONE	AS SPECIFIED	NONE	
17	11,400	9,500	50'	NONE	AS SPECIFIED	NONE	
18	11,500	10,750	75'	NONE	AS SPECIFIED	NONE	
19	11,600	11,000	75'	NONE	AS SPECIFIED	NONE	
20	11,500	11,500	50'	NONE	AS SPECIFIED	NONE	
21	11,500	12,500	50'	NONE	AS SPECIFIED	NONE	
22	12,500	11,500	10'	NONE	NONE	NONE	
23	12,500	12,500	10'	NONE	NONE	NONE	
24	13,500	12,500	10'	NONE	NONE	AT 7'	
25	13,500	13,500	10'	NONE	NONE	NONE	
26	15,500	9,000	10'	NONE	NONE	AT 7'	
27	14,500	8,500	10'	NONE	NONE	AT 7'	
28	14,500	9,500	10'	NONE	NONE	AT 7'	
29	13,500	8,500	10'	NONE	NONE	AT 7'	
30	13,500	9,500	10'	NONE	NONE	AT 7'	
31	13,500	10,500	10'	NONE	NONE	NONE	
32	12,500	10,500	10'	NONE	NONE	AT 7'	
33	12,500	8,500	10'	NONE	NONE	NONE	
34	11,500	8,500	10'	NONE	NONE	NONE	
35	10,500	8,500	10'	NONE	NONE	NONE	
36	12,200	9,300	50'	NONE	AS SPECIFIED	NONE	
37	11,600	10,300	50'	NONE	AS SPECIFIED	NONE	
38	11,150	10,200	100'	NONE	AS SPECIFIED	NONE	
39	11,150	10,400	100'	NONE	AS SPECIFIED	NONE	
40	11,150	10,650	100'	NONE	AS SPECIFIED	NONE	

DATE	REVISIONS AND RECORD OF ISSUE	NO.
7-11-85	CONFORMED TO CONSTRUCTION RECORDS	8
7-15-76	ISSUED FOR REFERENCE - SPEC. C-6F	7
3-17-76	ISSUED FOR REFERENCE - SPEC. C-6F	6
	ISSUED FOR REFERENCE - SPEC. C-6D	5
2-26-75	ISSUED FOR REFERENCE - SPEC. C-6B	4
	ISSUED FOR REFERENCE - SPEC. C-6B	3
	REVISED PER FIELD RECORDS	2
1-21-74	ISSUED FOR REFERENCE, SPEC. C-6A	1
8-15-73	BID ISSUE	0

SCALE: 200' 100' 0' 200' 400'

DEPT HEAD CLM
DES ENGR VEA
CHECKED
DRAWN SBS

I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF IOWA

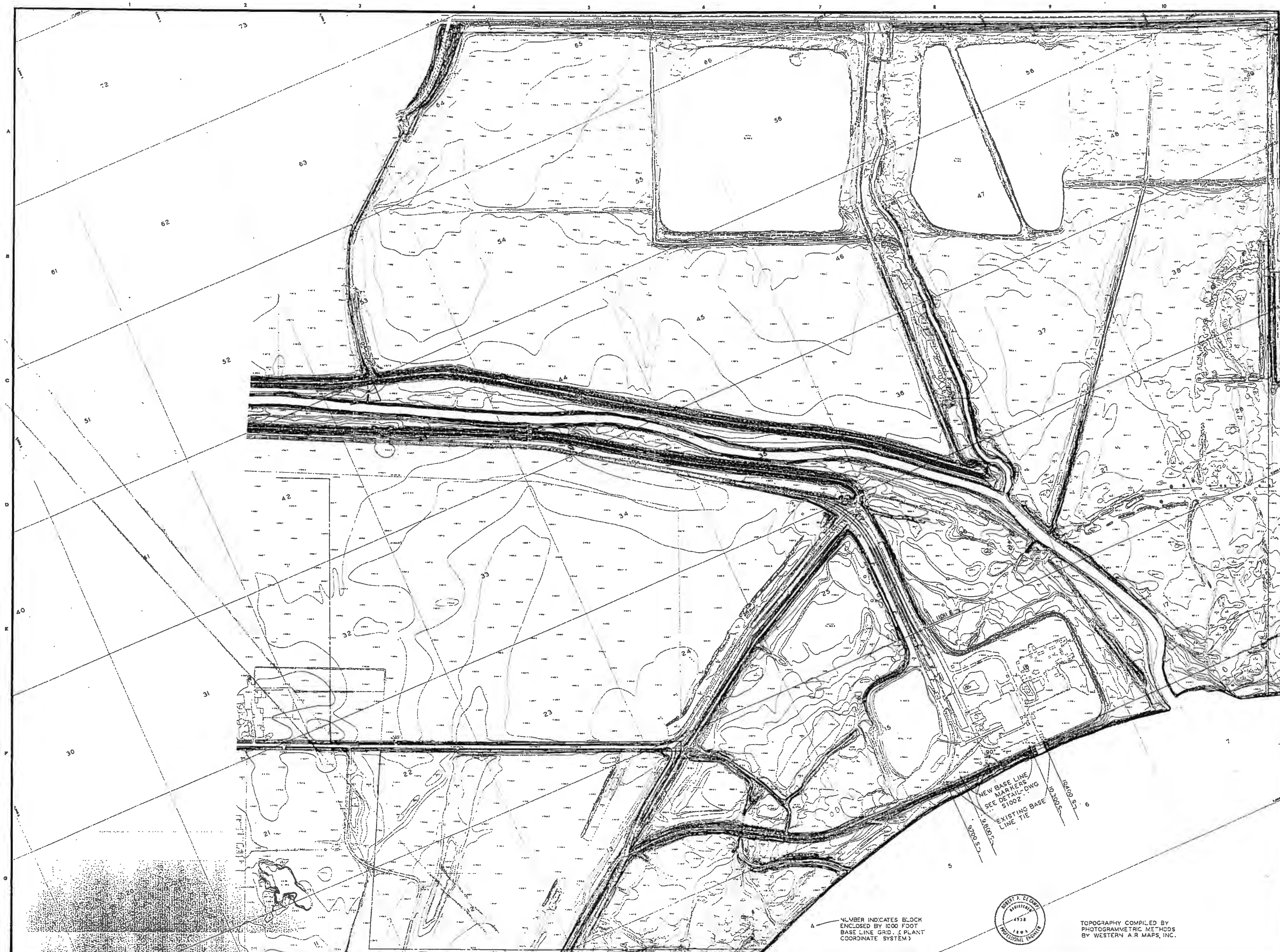
SIGNED Robert A. DeCamp
DATE 1-21-74 REG. NO. 4938

ROBERT A. DE CAMP REGISTERED 4938 IOWA PROFESSIONAL ENGINEER

BLACK & VEATCH
CONSULTING ENGINEERS
PROJECT 6247

IOWA POWER AND LIGHT COMPANY
COUNCIL BLUFFS STATION UNIT 3
TEST BORING LOCATION PLAN

B&V DWG NO. S1000



DATE	REVISIONS AND RECORD OF ISSUE	NO.
	CONFORMED TO CONSTRUCTION RECORDS	3
	ADDED PROPERTY LINE, ISSUED FOR CONTRACT SPEC. C-GA	2
	ISSUED FOR BID, SPEC. C-GA	
	ISSUED FOR REGULATORY AGENCY'S REVIEW	0

CONTOUR INTERVAL 1'

200' 100' 0' 200' 400'

DES. ENGR. VEA
CHECKED JLW
DRAWN WAM

I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF IOWA

SIGNED R.J. DeCamp

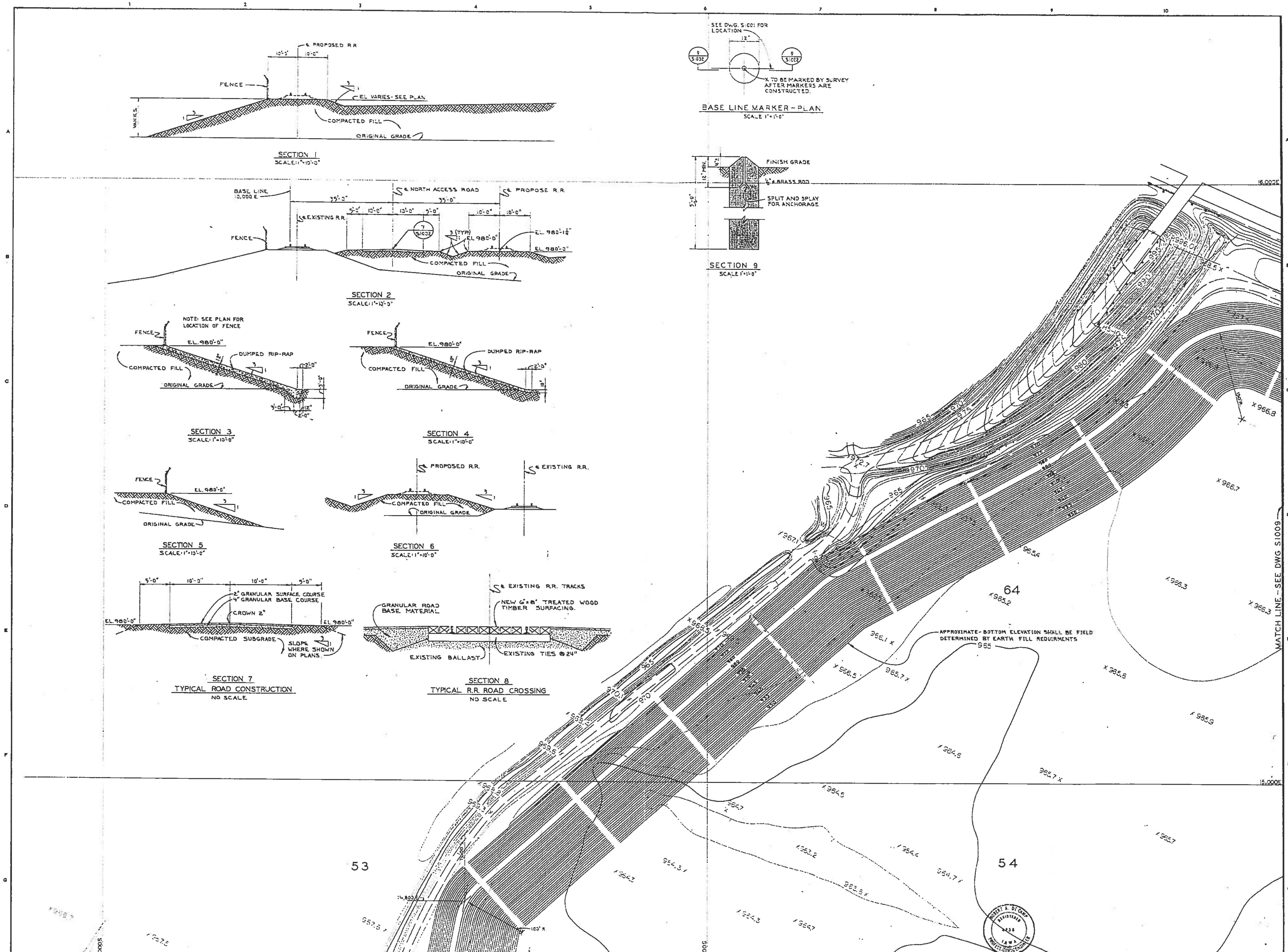
DATE 1-7-7_ REG. NO. 4938

BLACK & VEATCH CONSULTING ENGINEERS

PROJECT 6247

IOWA POWER AND LIGHT COMPANY
COUNCIL BLUFFS STATION UNIT 3
ORIGINAL GRADES
SITE PLAN

B&V DWG NO. S1001



5-15-74	REVISED CORNER CONTOURS	3	BLD	BLD	VEA
3-18-74	ISSUED FOR CONTRACT, SPEC. C-6A	2			
1-21-74	ISSUED FOR BID, SPEC. C-6A	1			
1-7-74	ISSUED FOR REGULATORY AGENCY'S REVIEW	0			
DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK	APP

4-18-80 CONFORMED TO CONSTRUCTION RECORDS

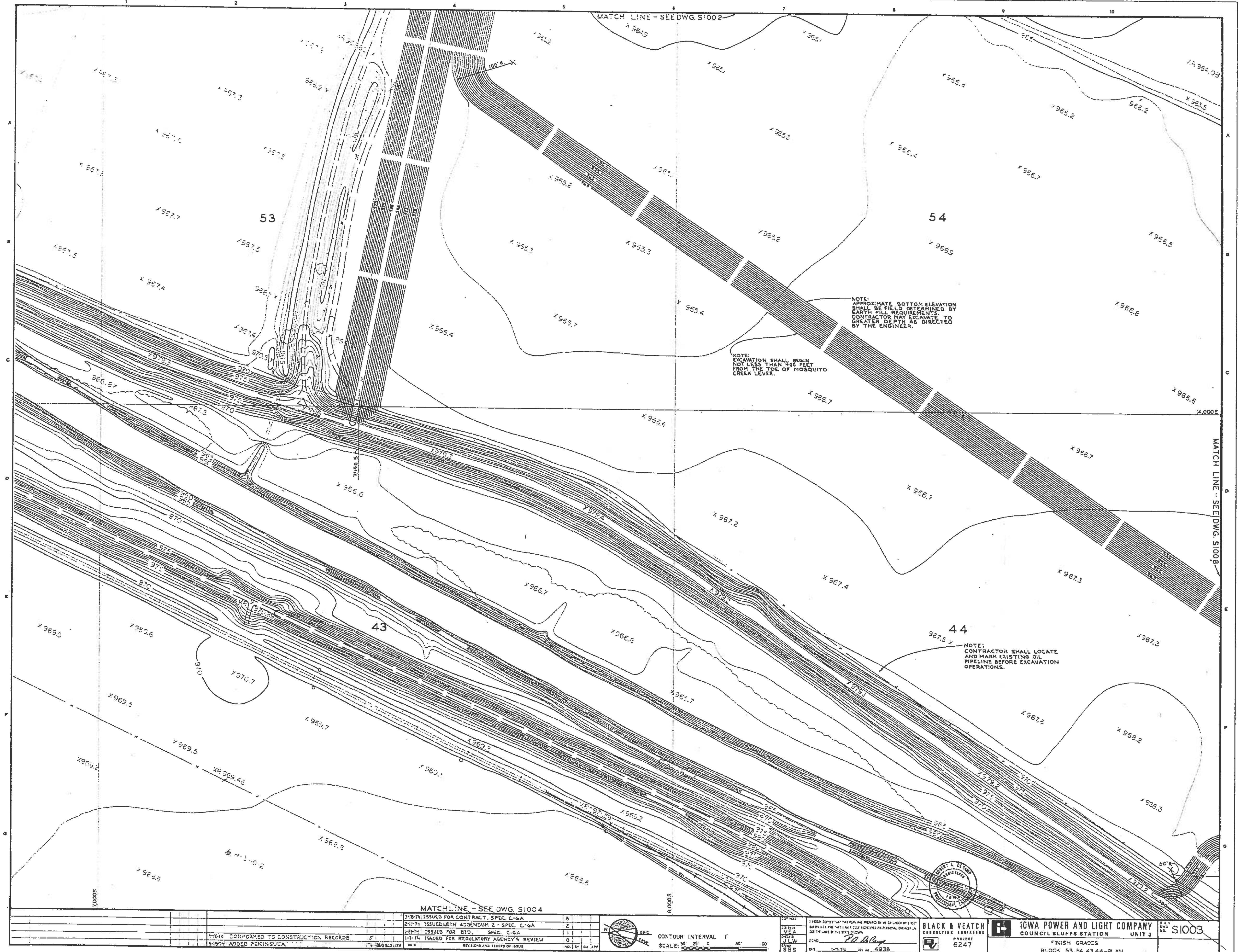
CONTOUR INTERVAL 1'
SCALE: 50' 25 0 50 100

DESIGNED VEA
CHECKED JLW
DRAWN SDM
DATE 1-7-74 REG. NO. 4938

BLACK & VEATCH
CONSULTING ENGINEERS
PROJECT 6247

IOWA POWER AND LIGHT COMPANY
COUNCIL BLUFFS STATION UNIT 3
FINISH GRADES
BLOCK 63, 64, 53, 54 - PLAN

DWG. NO. S1002


MATCH LINE – SEE DWG. S1002
MATCH LINE – SEE DWG. S1008
MATCHLINE – SEE DWG. S1004
53
54
43
44
NOTE: APPROXIMATE BOTTOM ELEVATION SHALL BE FIELD DETERMINED BY EARTH FILL REQUIREMENTS. CONTRACTOR MAY EXCAVATE TO GREATER DEPTH AS DIRECTED BY THE ENGINEER.
NOTE: EXCAVATION SHALL BEGIN NOT LESS THAN 400 FEET FROM THE TOE OF MOSQUITO CREEK LEVEE.
NOTE: CONTRACTOR SHALL LOCATE AND MARK EXISTING OIL PIPELINE BEFORE EXCAVATION OPERATIONS.
14,000E
7,000S
8,000S
3-18-74 ISSUED FOR CONTRACT, SPEC. C-6A 3
2-11-74 ISSUED WITH ADDENDUM 2 - SPEC. C-6A 2
1-21-74 ISSUED FOR BID. SPEC. C-6A 1
1-7-74 ISSUED FOR REGULATORY AGENCY'S REVIEW 0
CONFORMED TO CONSTRUCTION RECORDS 5
ADDED PENINSULA
REVISIONS AND RECORD OF ISSUE
CONTOUR INTERVAL 1'
SCALE: 50' 25' 0 50' 100'
VEA
JLW
SBS
BLACK & VEATCH CONSULTING ENGINEERS
PROJECT 6247
IOWA POWER AND LIGHT COMPANY
COUNCIL BLUFFS STATION UNIT 3
FINISH GRADES
BLOCK 53,54,43,44–PLAN
S1003

4-1-90	CONFORMED TO CONSTRUCTION RECORDS	9		
5-16-75	ISSUED FOR REFERENCE, SPEC. S-30A	8	SOM BLD VEA	
3-3-75	ISSUED FOR REFERENCE, SPEC. S-30A	7	SOM BLD VEA	
10-29-74	REVISED DITCH	6	SOM VEA VEA	
6-28-74	ADDED DITCH OVER WATER MAIN	5	BLD BLD VEA	
5-15-74	ADDED PENINSULA	4	BLD BLD VEA	
3-18-74	ISSUED FOR CONTRACT, SPEC. C-6A	3		
2-11-74	ISSUED WITH ADDENDUM 2 - SPEC. C-6A	2		
1-21-74	ISSUED FOR BID. SPEC. C-6A	1		
1-7-74	ISSUED FOR REGULATORY AGENCY'S REVIEW	0		
DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY CK APP	

GRID TRUE

CONTOUR INTERVAL 1'

SCALE: 50' 25' 0 50' 100'

DESIGNED VEA
CHECKED JLW
DRAWN WAH

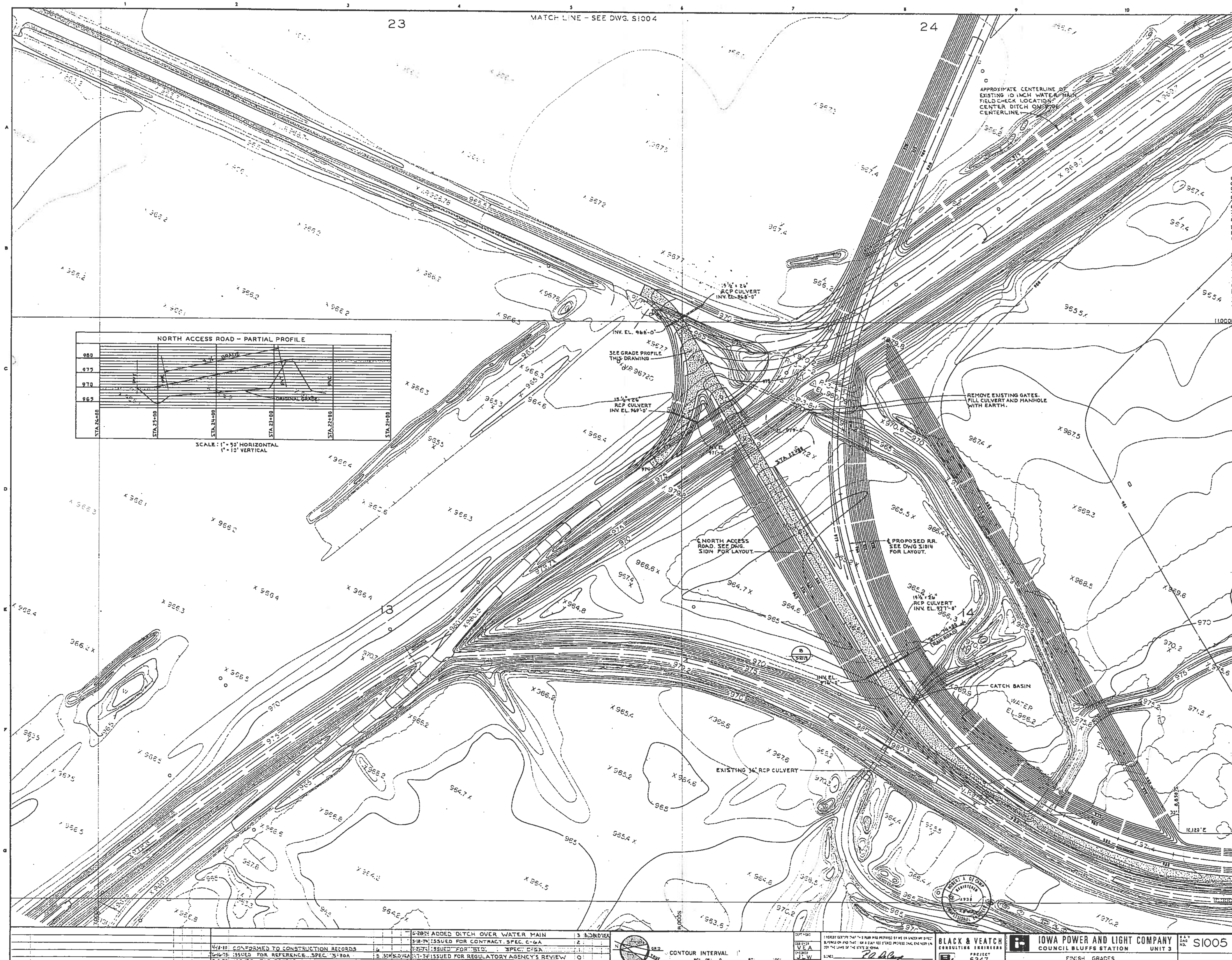
NAME P. A. DeCamp
DATE 1-7-74 REG. NO. 4938

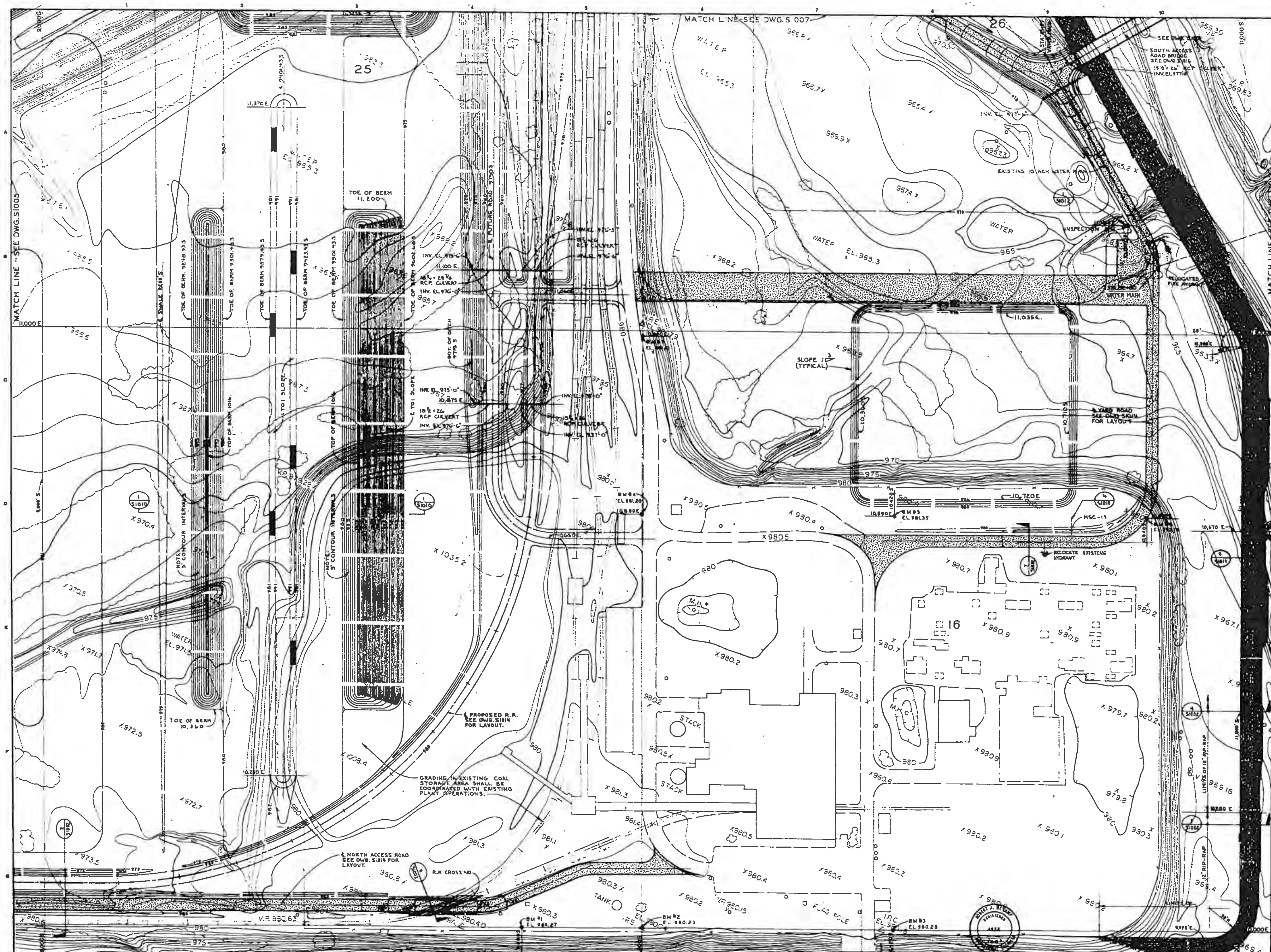
ROBERT A. DE CAMP REGISTERED 4938 IOWA PROFESSIONAL ENGINEER

BLACK & VEATCH CONSULTING ENGINEERS
PROJECT 6247

IOWA POWER AND LIGHT COMPANY
COUNCIL BLUFFS STATION UNIT 3
FINISH GRADES
BLOCK 33, 34, 23, 24 - PLAN

B&V DWG. NO. S1004


MATCH LINE - SEE DWG. S1004
23
24
MATCH LINE - SEE DWG. S1006
13
14
APPROXIMATE CENTERLINE OF EXISTING 10 INCH WATER MAIN FIELD CHECK LOCATION. CENTER DITCH ON PIPE CENTERLINE
15¾" x 24" RCP CULVERT INV. EL. 968'-0"
INV. EL. 966'-0"
SEE GRADE PROFILE THIS DRAWING
15¾" x 24" RCP CULVERT INV. EL. 969'-0"
REMOVE EXISTING GATES. FILL CULVERT AND MANHOLE WITH EARTH.
℄ NORTH ACCESS ROAD. SEE DWG. S1014 FOR LAYOUT.
℄ PROPOSED R.R. SEE DWG S1014 FOR LAYOUT.
15¾" x 24" RCP CULVERT INV. EL. 977'-0"
CATCH BASIN
WATER EL. 966.2
EXISTING 36" RCP CULVERT
NORTH ACCESS ROAD - PARTIAL PROFILE
ORIGINAL GRADE
STA. 26+00
STA. 25+00
STA. 24+00
STA. 23+00
STA. 22+00
STA. 21+00
SCALE: 1" = 50' HORIZONTAL 1" = 10' VERTICAL
4-28-80 ADDED DITCH OVER WATER MAIN
3-18-75 ISSUED FOR CONTRACT, SPEC. C-6A
4-18-80 CONFORMED TO CONSTRUCTION RECORDS
6-16-75 ISSUED FOR REFERENCE, SPEC. 3-30A
3-3-75 ISSUED FOR REFERENCE, SPEC. 3-30A
ISSUED FOR BID, SPEC. C-6A
ISSUED FOR REGULATORY AGENCY'S REVIEW
REVISIONS AND RECORD OF ISSUE
CONTOUR INTERVAL 1'
SCALE: 50' 25' 0 50' 100'
BLACK & VEATCH CONSULTING ENGINEERS
PROJECT 6247
IOWA POWER AND LIGHT COMPANY
COUNCIL BLUFFS STATION UNIT 3
FINISH GRADES
BLOCK 23, 24, 13, 14 - PLAN
S1005



4-12-80	CONFORMED TO CONSTRUCTION RECORDS	
6-16-75	ISSUED FOR REFERENCE - SPEC. C-GO	9
6-16-75	ISSUED FOR REFERENCE, SPEC. S-30A	8
3-3-75	ISSUED FOR REFERENCE, SPEC. S-30A	7
2-26-75	ISSUED FOR REFERENCE - SPEC. C-6B	6
1-23-75	REVISED GRADING, COORD. DELETED NEW MAIN	
	REVISED DITCH, MOVED CULVERTS, ADDED CULVERT	
	ISSUED FOR REFERENCE - SPEC. C-6B	5
	ADDED DITCH, M.H., NEW MAIN, DEPRESSION	
5-15-74	MOVED CONSTRUCTION ROAD, ADDED BM'S.	3
3-18-74	ISSUED FOR CONTRACT, SPEC. C-6A	2
	ISSUED FOR BID, SPEC. C-6A	1
1-7-74	ISSUE FOR REGULATORY AGENCY'S REVIEW	0

CONTOUR INTERVAL 1'

SCALE: 50' 25' 0 50 100'

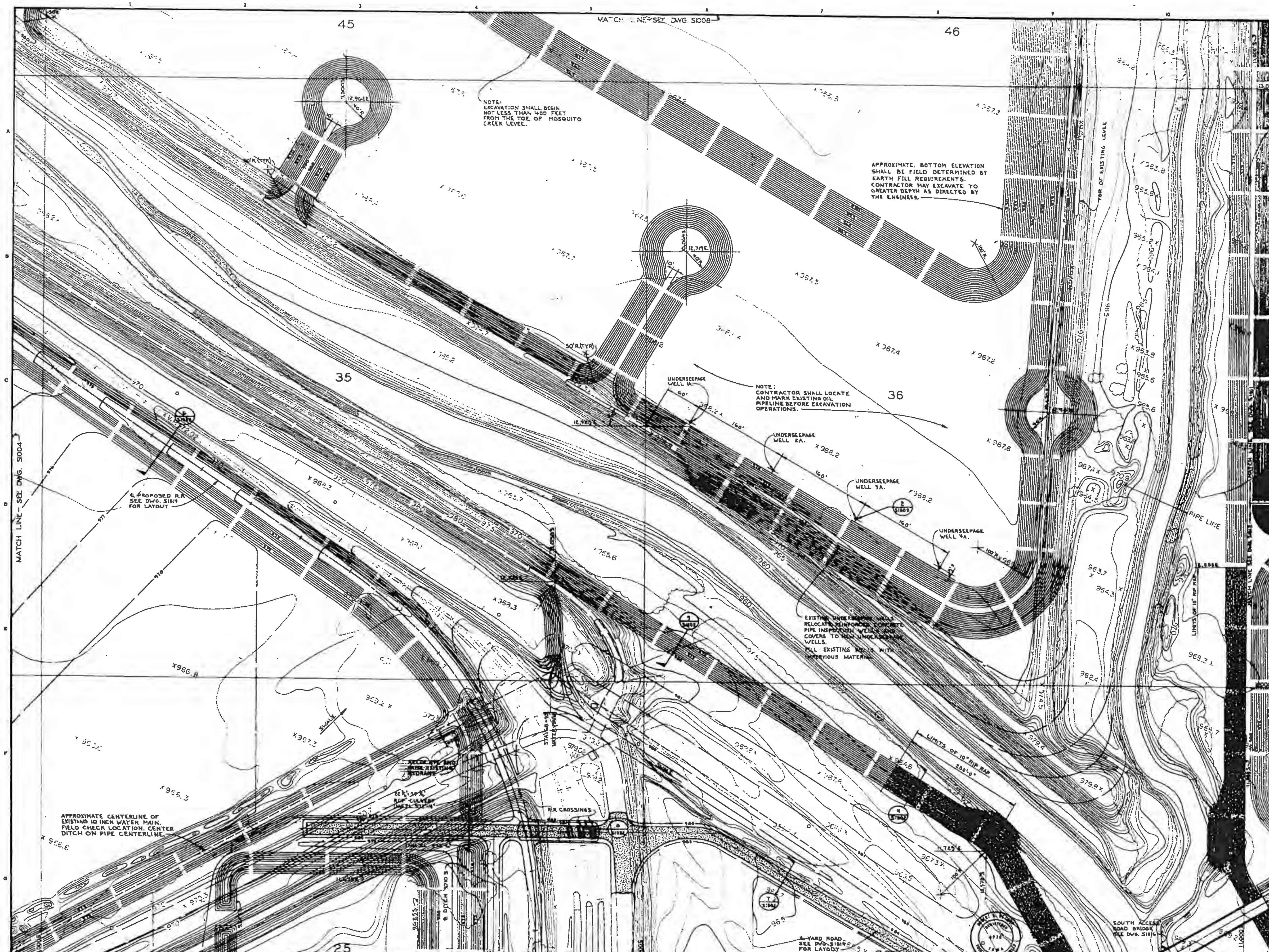
BLACK & VEATCH CONSULTING ENGINEERS

PROJECT 6247

IOWA POWER AND LIGHT COMPANY
COUNCIL BLUFFS STATION UNIT 3

FINISH GRADES
BLOCK 15, 16, 25, 26 — PLAN

S1006



DATE	REVISIONS AND RECORD OF ISSUE	NO.
4-18-80	CONFORMED TO CONSTRUCTION RECORDS	11
6-16-75	ISSUED FOR REFERENCE - SPEC. C-6D	10
6-6-75	ISSUED FOR REFERENCE - SPEC. S-30A	9
3-3-75	ISSUED FOR REFERENCE - SPEC. S-30A	8
2-26-75	ISSUED FOR REFERENCE - SPEC. C-6B	7
11-27-74	REVISED ACCORDING TO MODIFICATION 17	
	REVISED DITCH, MOVED CULVERT, DELETED NEW MAIN	
	ISSUED FOR REFERENCE - SPEC. C-6B	6
	ADDED DITCH OVER WATER MAIN; NEW MAIN	5
5-15-74	ADDED PENINSULAS	4
	ISSUED FOR CONTRACT, SPEC. C-6A	3
2-11-74	ISSUED WITH ADDENDUM 2 - SPEC. C-6A	2
1-21-74	ISSUED FOR BID, SPEC. C-6A	1
1-7-74	ISSUED FOR REGULATORY AGENCY'S REVIEW	0

BLACK & VEATCH CONSULTING ENGINEERS
PROJECT 6247

IOWA POWER AND LIGHT COMPANY
COUNCIL BLUFFS STATION UNIT 3
FINISH GRADES
BLOCK 25, 26, 35, 36 - PLAN
S1007

Date	Revision	No.
3-16-74	ISSUED FOR CONTRACT SPEC. C-6A	3
2-11-74	ISSUED WITH ADDENDUM 2 - SPEC. C-6A	2
1-21-74	ISSUED FOR BID, SPEC. C-6A	1
1-7-74	ISSUED FOR REGULATORY AGENCY'S REVIEW	0

Date	Revision	No.
4-16-80	CONFORMED TO CONSTRUCTION RECORDS	6
6-12-74	MOVED DITCH TO CLEAR HIGHWAY R.O.W.	5
5-15-74	ADDED PENINSULA AND TWO NOTES.	4

REVISIONS AND RECORD OF ISSUE

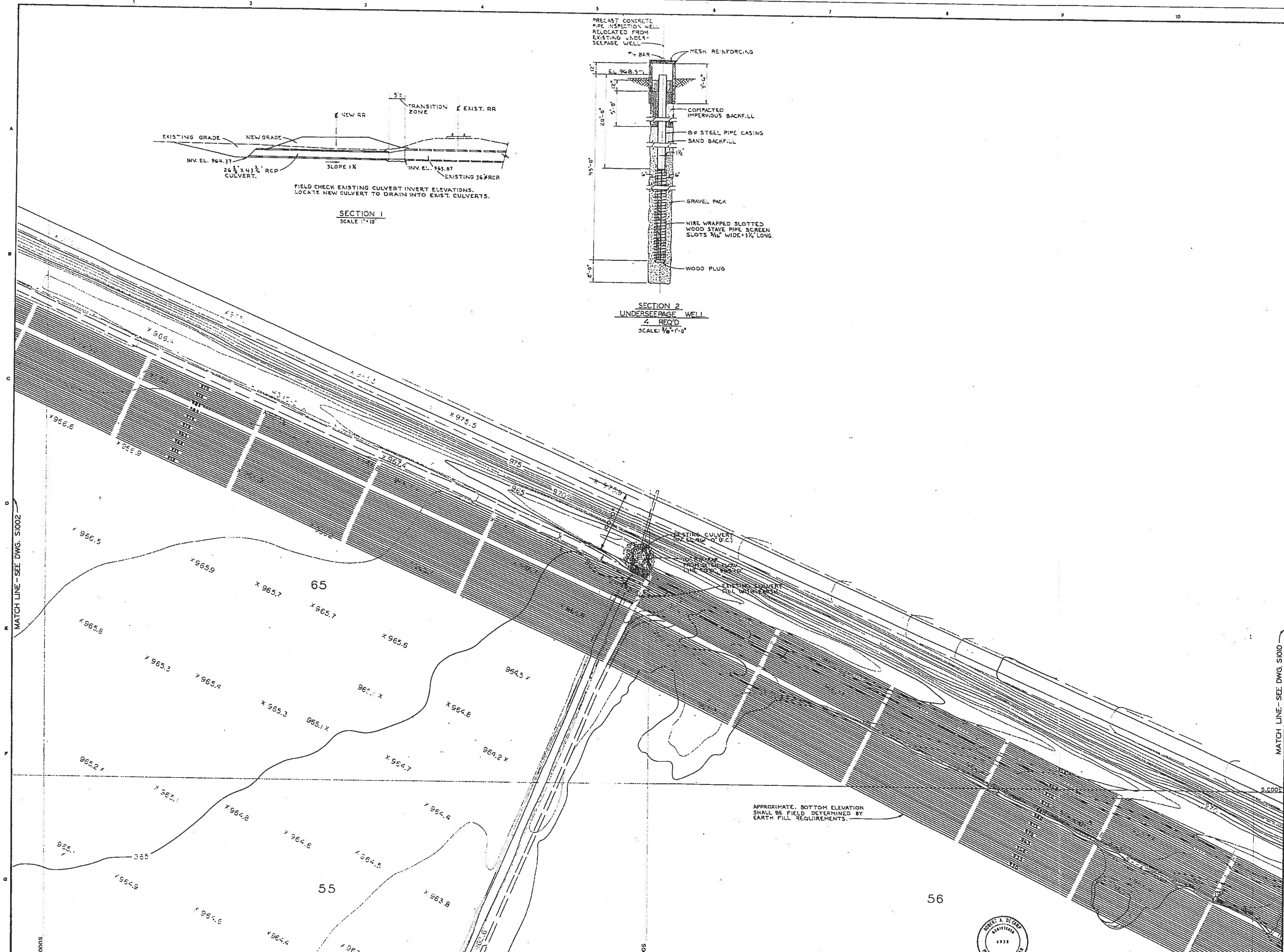
CONTOUR INTERVAL 1'
SCALE: 50 25' 0 50 100'

DESIGNED VEA
CHECKED JLW
DRAWN SBS
DATE 1-7-74
REG. NO. 4938

BLACK & VEATCH
CONSULTING ENGINEERS
PROJECT 6247

IOWA POWER AND LIGHT COMPANY
COUNCIL BLUFFS STATION UNIT 3
FINISH GRADES
BLOCK 45,46,55,56 - PLAN

DWG. NO. S1008



4-12-80	CONFORMED TO CONSTRUCTION RECORDS	6		3-18-74	ISSUED FOR CONTRACT, SPEC. C-6A	3	
6-12-74	MOVED DITCH TO CLEAR HIGHWAY ROW	5	SDM VEA	2-11-74	ISSUED WITH ADDENDUM 2 - SPEC. C-6A	2	
5-15-74	ADDED WOOD PLUG TO WELL AND ADDED DITCH	4	SLD SLD VEA	2-1-74	ISSUED FOR BID, SPEC. C-6A	1	
				1-7-74	ISSUED FOR REGULATORY AGENCY'S REVIEW	0	
				DATE	REVISIONS AND RECORD OF ISSUE	NO. BY CK APP	

CONTOUR INTERVAL 1'
SCALE: 50' 25' 0 50' 100'

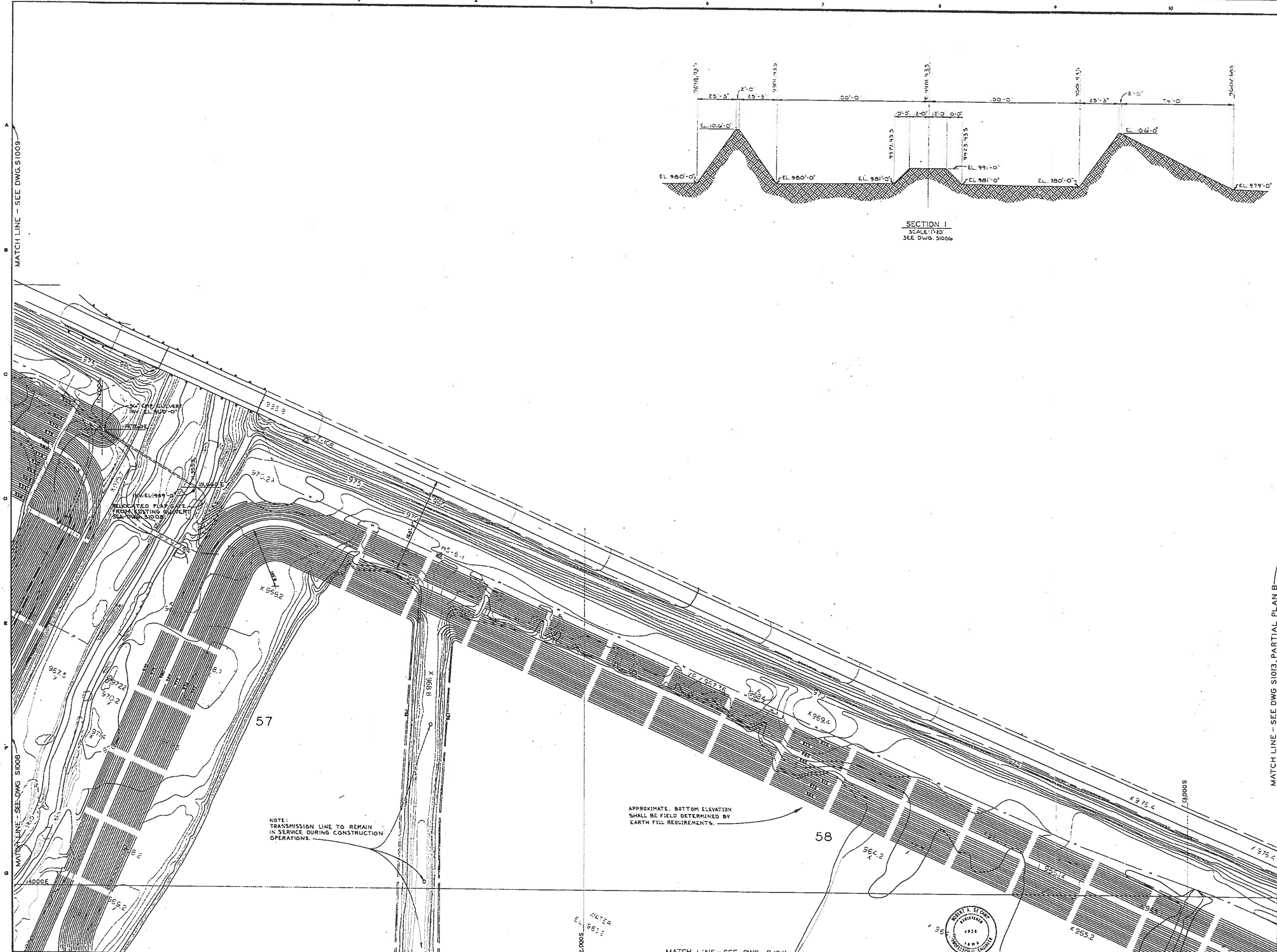
DESIGNED VEA · CHECKED JLW · DRAWN SDM

I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF IOWA.
SIGNED R.A. DeCamp · DATE 1-7-74 · REG. NO. 4938

ROBERT A. DE CAMP · REGISTERED · 4938 · IOWA · PROFESSIONAL ENGINEER

BLACK & VEATCH CONSULTING ENGINEERS · PROJECT 6247

IOWA POWER AND LIGHT COMPANY
COUNCIL BLUFFS STATION UNIT 3
FINISH GRADES
BLOCK 55, 56, 65, 66 — PLAN
DWG NO. S1009



Date	Revisions and record of issue	No.	By	Ck	App
5-15-74	ADDED DRAINAGE DITCH	3	SDM	DLB	VEA
3-18-74	ISSUED FOR CONTRACT SPEC. C-6A	2			
1-21-74	ISSUED FOR BID. SPEC. C-6A	1			
1-7-74	ISSUED FOR REGULATORY AGENCY'S REVIEW	0			

Date	Revisions and record of issue	No.	By	Ck	App
4-11-80	CONFORMED TO CONSTRUCTION RECORDS	6			
0-25-74	ADDED SECTION	5	SDM	VEA	VEA
6-12-74	MOVED DITCH TO CLEAR HIGHWAY R.O.W.	4	SDM	VEA	VEA

DEPT HEAD
RES ENGR VEA
CHECKED JLW
DRAWN SDM

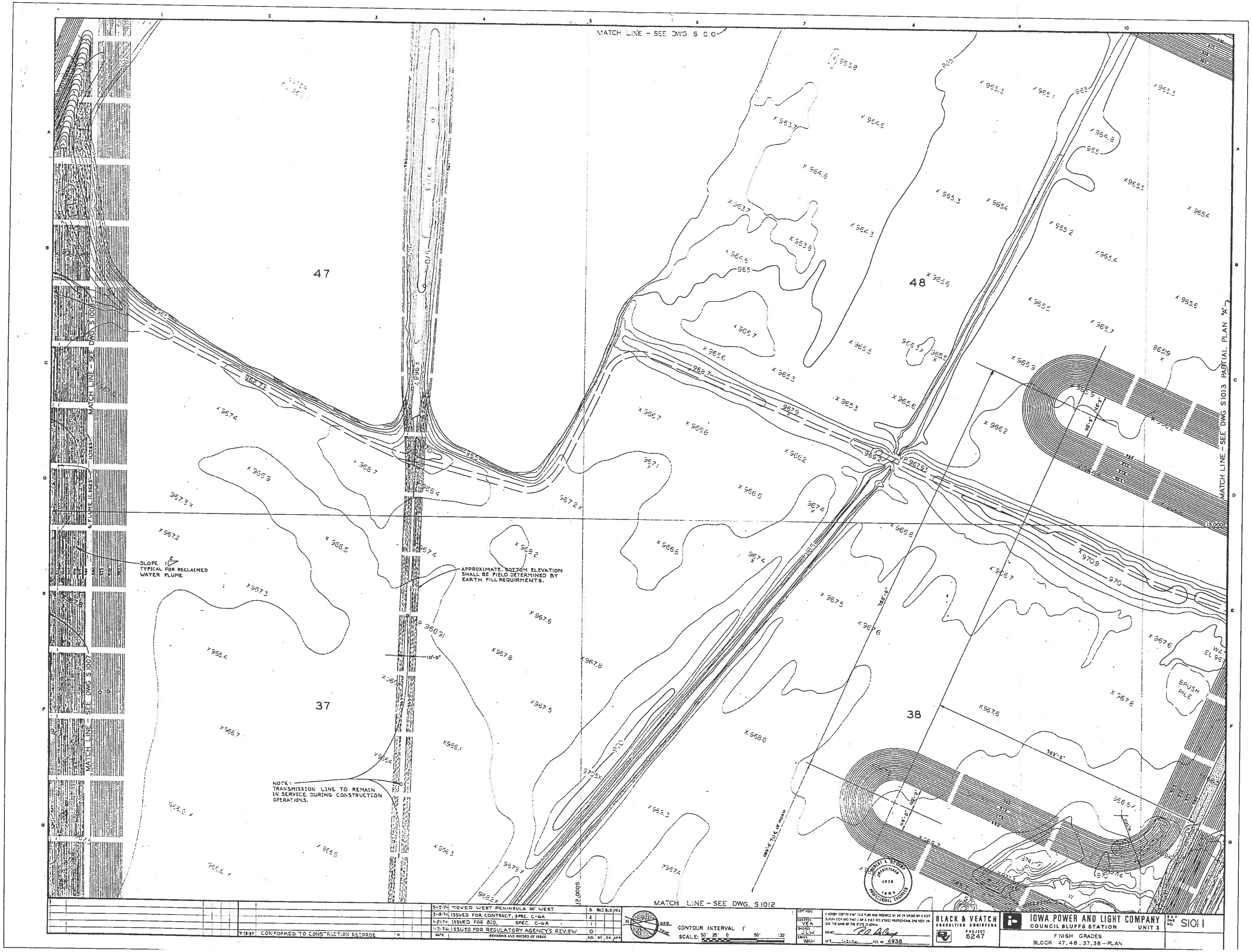
I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF IOWA.
SIGNED R.A. DeCamp
DATE 1-7-74 REG. NO. 4938

ROBERT A. DE CAMP REGISTERED 4938 IOWA PROFESSIONAL ENGINEER

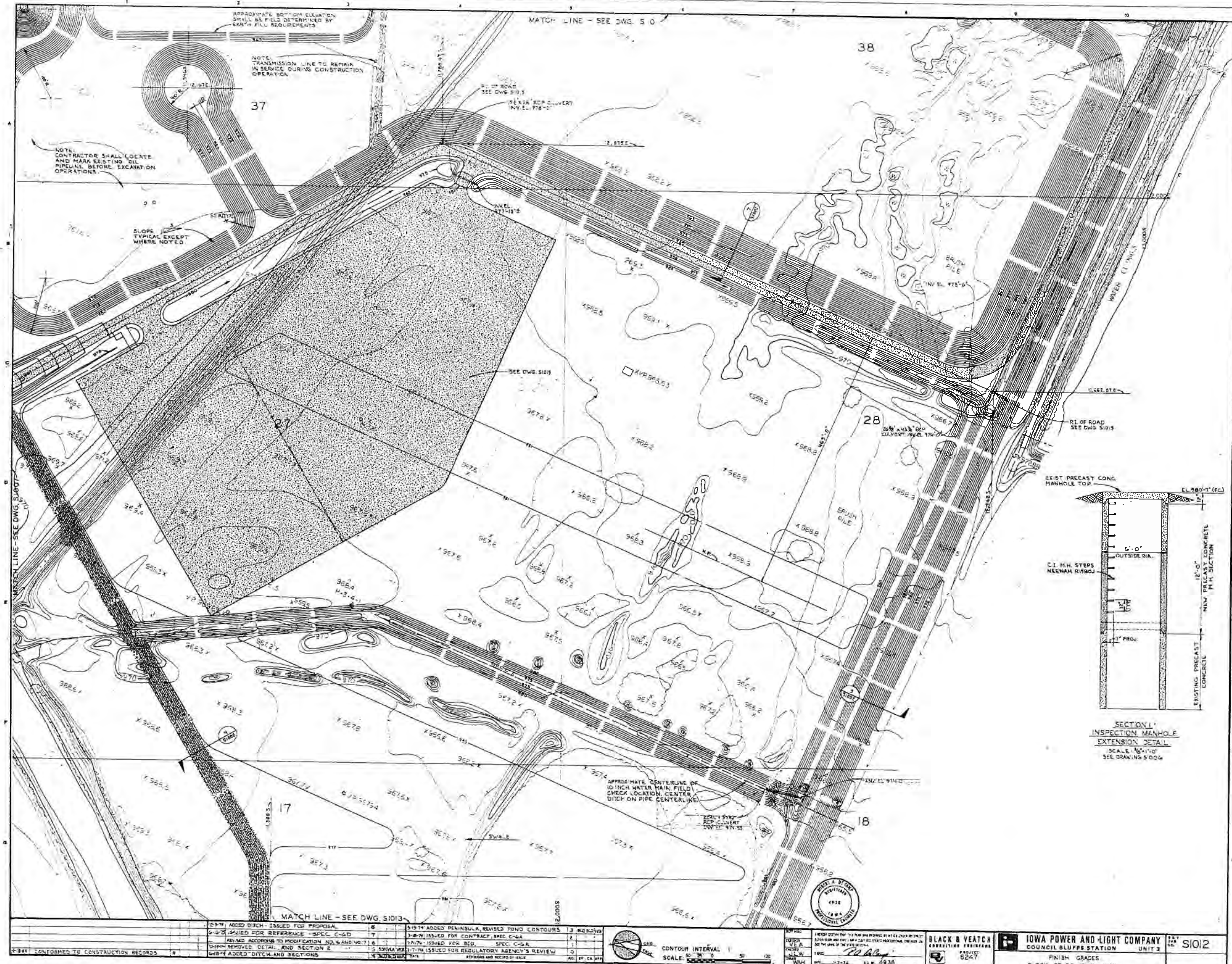
BLACK & VEATCH
CONSULTING ENGINEERS
PROJECT 6247

IOWA POWER AND LIGHT COMPANY
COUNCIL BLUFFS STATION UNIT 3
FINISH GRADES
BLOCK 57, 58-PLAN

B & V DWG NO. S1010



MATCH LINE - SEE DWG. S1010
MATCH LINE - SEE DWG. S1012
MATCH LINE - SEE DWG. S1008
MATCH LINE - SEE DWG. S1007
MATCH LINE - SEE DWG. S1013 PARTIAL PLAN "A"
47
48
37
38
SLOPE 1:2 TYPICAL FOR RECLAIMED WATER FLUME
APPROXIMATE BOTTOM ELEVATION SHALL BE FIELD DETERMINED BY EARTH FILL REQUIRMENTS.
NOTE: TRANSMISSION LINE TO REMAIN IN SERVICE DURING CONSTRUCTION OPERATIONS.
BRUSH PILE
5-5-74 MOVED WEST PENINSULA 30' WEST
3-15-74 ISSUED FOR CONTRACT, SPEC. C-6A
1-21-74 ISSUED FOR BID, SPEC. C-6A
1-7-74 ISSUED FOR REGULATORY AGENCY'S REVIEW
4-18-80 CONFORMED TO CONSTRUCTION RECORDS
REVISIONS AND RECORD OF ISSUE
CONTOUR INTERVAL 1'
SCALE: 50' 25' 0 50' 100'
VEA
JLW
WAH
4938
BLACK & VEATCH CONSULTING ENGINEERS
PROJECT 6247
IOWA POWER AND LIGHT COMPANY
COUNCIL BLUFFS STATION UNIT 3
FINISH GRADES
BLOCK 47, 48, 37, 38 - PLAN
S1011



MATCH LINE - SEE DWG. S1011
APPROXIMATE BOTTOM ELEVATION SHALL BE FIELD DETERMINED BY EARTH FILL REQUIREMENTS
NOTE: TRANSMISSION LINE TO REMAIN IN SERVICE DURING CONSTRUCTION OPERATION
NOTE: CONTRACTOR SHALL LOCATE AND MARK EXISTING OIL PIPELINE BEFORE EXCAVATION OPERATIONS
SLOPE TYPICAL EXCEPT WHERE NOTED
37
38
27
28
17
18
SEE DWG. S1015
BRUSH PILE
R.L. OF ROAD SEE DWG S1015
EXIST PRECAST CONC. MANHOLE TOP
C.I. M.H. STEPS NEENAH R1980J
6'-0" OUTSIDE DIA.
12'-0" NEW PRECAST CONCRETE M.H. SECTION
EXISTING PRECAST CONCRETE
SECTION 1 - INSPECTION MANHOLE EXTENSION DETAIL
SCALE: 1/2"=1'-0"
SEE DRAWING S1006
APPROXIMATE CENTERLINE OF 10 INCH WATER MAIN. FIELD CHECK LOCATION. CENTER DITCH ON PIPE CENTERLINE
SWALE
MATCH LINE - SEE DWG. S1013
CONFORMED TO CONSTRUCTION RECORDS
ADDED DITCH - ISSUED FOR PROPOSAL
ISSUED FOR REFERENCE - SPEC. C-6D
REVISED ACCORDING TO MODIFICATION NO. 6 AND NO. 7
REMOVED DETAIL AND SECTION 2
ADDED DITCH AND SECTIONS
ADDED PENINSULA, REVISED POND CONTOURS
ISSUED FOR CONTRACT, SPEC. C-6A
ISSUED FOR BID, SPEC. C-6A
ISSUED FOR REGULATORY AGENCY'S REVIEW
REVISIONS AND RECORD OF ISSUE
CONTOUR INTERVAL 1'
SCALE: 50 25 0 50 100
BLACK & VEATCH CONSULTING ENGINEERS
PROJECT 6247
IOWA POWER AND LIGHT COMPANY
COUNCIL BLUFFS STATION UNIT 3
FINISH GRADES
BLOCK 27, 28, 17, 18 — PLAN
S1012

DATE	REVISIONS AND RECORD OF ISSUE	NO.
4-11-85	CONFORMED TO CONSTRUCTION RECORDS	5
12-5-75	ADDED DITCH - ISSUED FOR PROPOSAL	4
5-13-74	REVISED DRAINAGE DITCH	3
3-18-74	ISSUED FOR CONTRACT, SPEC C-6A	2
1-21-74	ISSUED FOR BID, SPEC C-6A	1
1-7-74	ISSUE FOR REGULATORY AGENCY'S REVIEW	0

CONTOUR INTERVAL 1'

SCALE: 50 25 0 50' 100'

DESIGNED VEA
CHECKED JLW
DRAWN SDM

Reg. No. 4938

BLACK & VEATCH
CONSULTING ENGINEERS
PROJECT 6247

IOWA POWER AND LIGHT COMPANY
COUNCIL BLUFFS STATION UNIT 3

FINISH GRADES
PARTIAL BLOCK PLANS

B&V DWG NO. S1013

APPENDIX C

DOC 1.4 SITE PLAN MAP AND MONITORING NETWORK

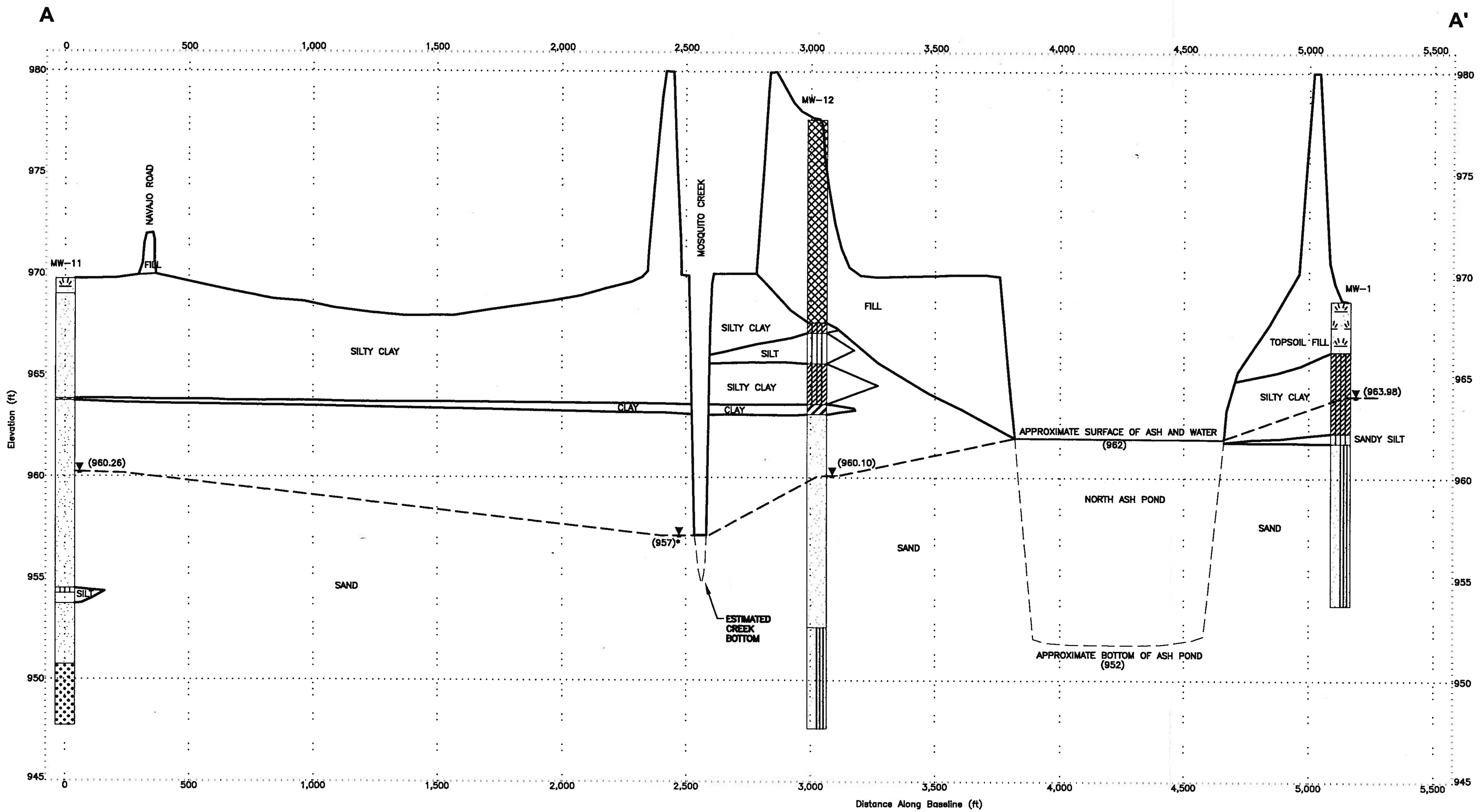
DESIGNED BY	ANGEL SHAWDA
DRAWN BY	NORA DAY
CHECKED BY	ANGEL SHAWDA
APPROVED BY	KEVIN ARMSTRONG
PROJECT MANAGER	KEVIN ARMSTRONG

0 400 800
SCALE IN FEET

MANAGING OFFICE	DES MOINES, IOWA
PROJECT	MIDAMERICAN ENERGY COMPANY WALTER SCOTT JR. ENERGY CENTER COUNCIL BLUFFS, IOWA
TITLE	SITE PLAN MAP AND MONITORING NETWORK

MWH

FIGURE	2
REVISION	
FILE NAME	



LITHOLOGY GRAPHICS

- Topsoil
- USCS High Plasticity Clay
- USCS Low Plasticity Silty Clay
- USCS Silt
- USCS Sandy Silt
- USCS Well-graded Sand
- USCS Poorly-graded Sand with Silt
- Fill (made ground)
- USCS Poorly-graded Sand

ESTIMATED WATER TABLE (BASED ON SEASONAL HIGH CONDITIONS – AUGUST 4, 2008)

(957)* ESTIMATED CREEK LEVEL (BASED ON TOPOGRAPHIC SURVEY)

DESIGNED BY	ANGEL SHAWDA
DRAWN BY	DAVID MIRANDA
CHECKED BY	ANGEL SHAWDA
APPROVED BY	KEVIN ARMSTRONG
PROJECT MANAGER	KEVIN ARMSTRONG

MANAGING OFFICE: DES MOINES, IOWA

PROJECT: MIDAMERICAN ENERGY COMPANY
WALTER SCOTT JR. ENERGY CENTER
COUNCIL BLUFFS, IOWA

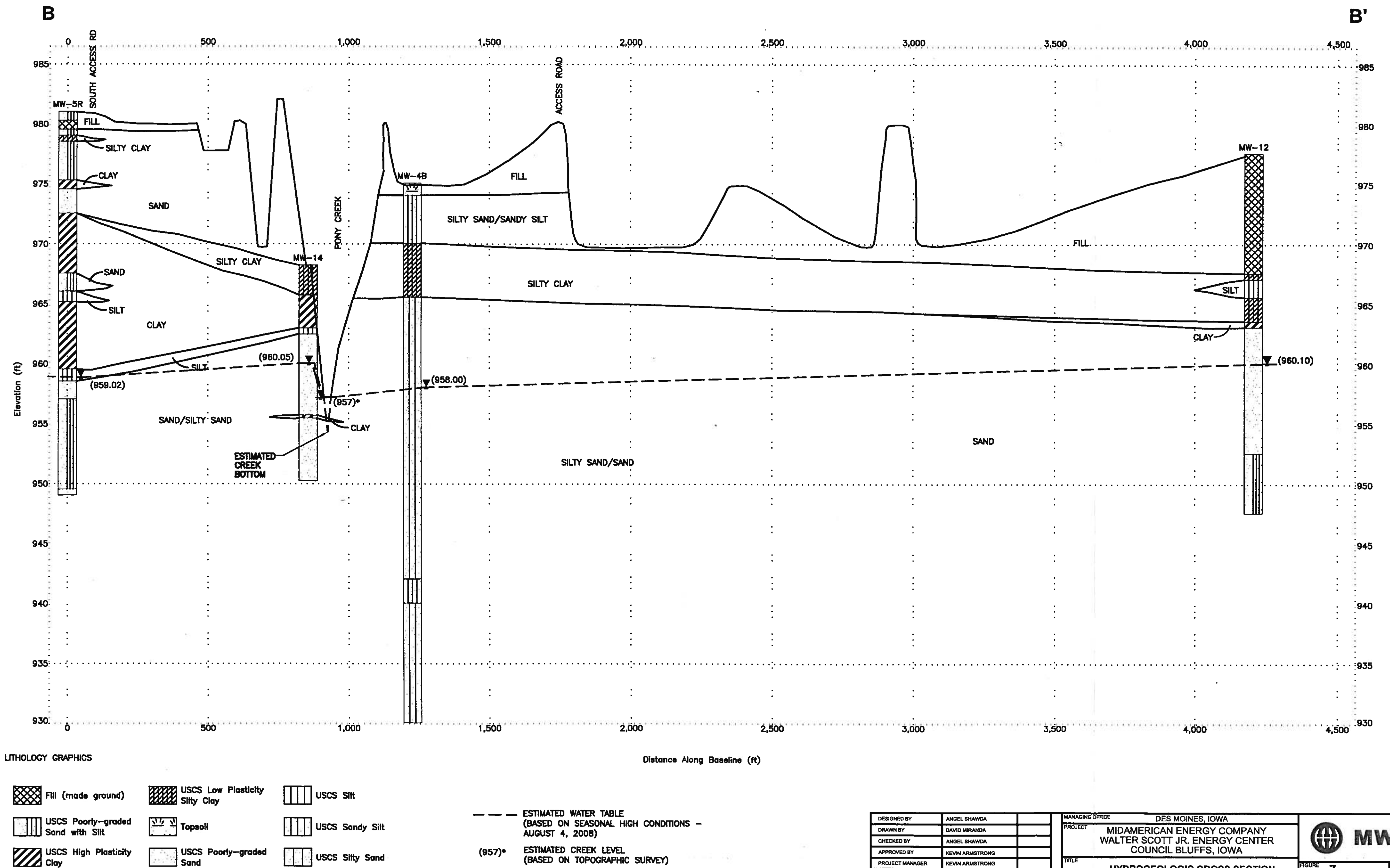
MWH

TITLE: HYDROGEOLOGIC CROSS SECTION A-A'

FIGURE 6

REVISION

FILE NAME



DESIGNED BY	ANGEL SHAWDA
DRAWN BY	DAVID MIRANDA
CHECKED BY	ANGEL SHAWDA
APPROVED BY	KEVIN ARMSTRONG
PROJECT MANAGER	KEVIN ARMSTRONG

MANAGING OFFICE DES MOINES, IOWA

PROJECT MIDAMERICAN ENERGY COMPANY
WALTER SCOTT JR. ENERGY CENTER
COUNCIL BLUFFS, IOWA

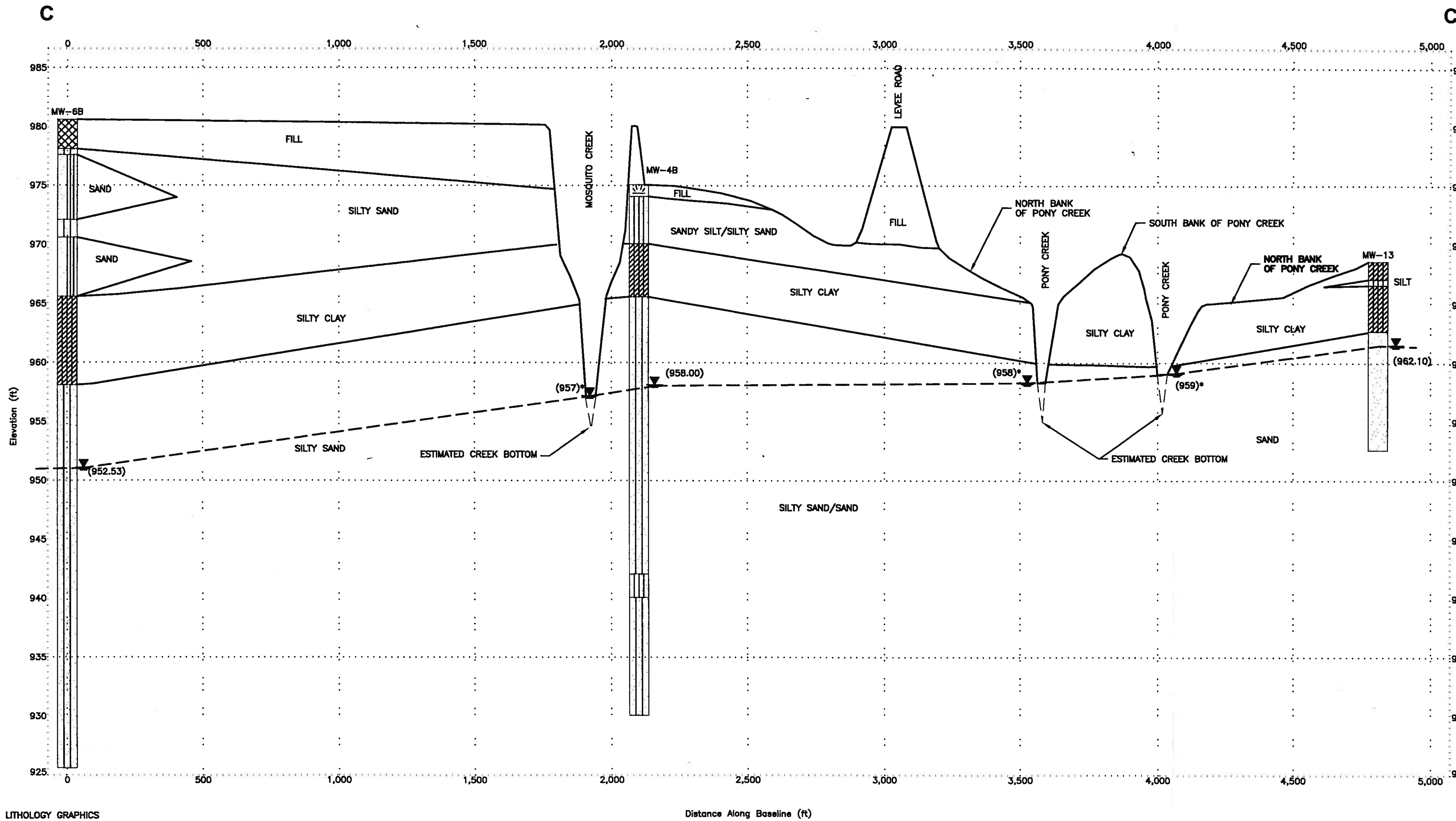
TITLE **HYDROGEOLOGIC CROSS SECTION B-B'**

MWH

FIGURE 7

REVISION

FILE NAME



LITHOLOGY GRAPHICS

- USCS Low Plasticity Silty Clay
- USCS Silty Sand
- Topsoil
- USCS Silt
- Fill (made ground)
- USCS Sandy Silt
- USCS Poorly-graded Sand
- USCS Poorly-graded Sand with Silt

— — — ESTIMATED WATER TABLE (BASED ON SEASONAL HIGH CONDITIONS – AUGUST 4, 2008)

(957)* ESTIMATED CREEK LEVEL (BASED ON TOPOGRAPHIC SURVEY)

DESIGNED BY	ANGEL SHAWDA
DRAWN BY	DAVID MIRANDA
CHECKED BY	ANGEL SHAWDA
APPROVED BY	KEVIN ARMSTRONG
PROJECT MANAGER	KEVIN ARMSTRONG

MANAGING OFFICE: DES MOINES, IOWA

PROJECT: MIDAMERICAN ENERGY COMPANY
WALTER SCOTT JR. ENERGY CENTER
COUNCIL BLUFFS, IOWA

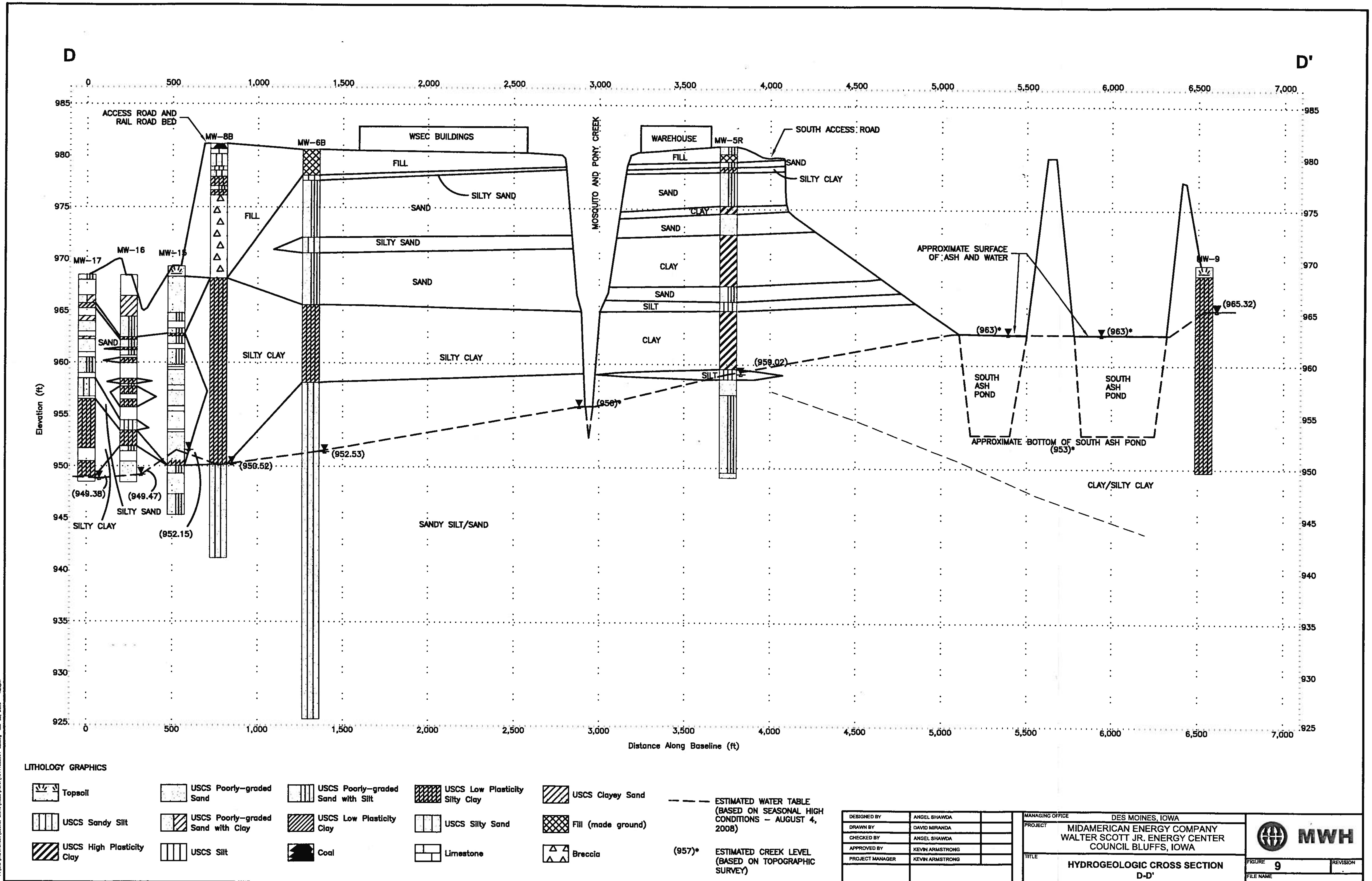
TITLE: HYDROGEOLOGIC CROSS SECTION C-C'

MWH

FIGURE 8

REVISION

FILE NAME


D
D'
ACCESS ROAD AND RAIL ROAD BED
MW-8B
MW-6B
WSEC BUILDINGS
MOSQUITO AND PONY CREEK
WAREHOUSE
MW-5R
SOUTH ACCESS ROAD
FILL
SILTY SAND
SAND
SILTY CLAY
CLAY
SILT
MW-17
MW-16
MW-15
MW-9
SILTY CLAY
SANDY SILT/SAND
APPROXIMATE SURFACE OF ASH AND WATER
SOUTH ASH POND
APPROXIMATE BOTTOM OF SOUTH ASH POND
(953)*
(963)*
(965.32)
(959.02)
(956)*
(952.53)
(950.52)
(949.38)
(949.47)
(952.15)
CLAY/SILTY CLAY
Elevation (ft)
Distance Along Baseline (ft)
LITHOLOGY GRAPHICS
Topsoil
USCS Sandy Silt
USCS High Plasticity Clay
USCS Poorly-graded Sand
USCS Poorly-graded Sand with Clay
USCS Silt
USCS Poorly-graded Sand with Silt
USCS Low Plasticity Clay
Coal
USCS Low Plasticity Silty Clay
USCS Silty Sand
Limestone
USCS Clayey Sand
Fill (made ground)
Breccia
ESTIMATED WATER TABLE (BASED ON SEASONAL HIGH CONDITIONS – AUGUST 4, 2008)
(957)* ESTIMATED CREEK LEVEL (BASED ON TOPOGRAPHIC SURVEY)
DESIGNED BY ANGEL SHAWDA
DRAWN BY DAVID MIRANDA
CHECKED BY ANGEL SHAWDA
APPROVED BY KEVIN ARMSTRONG
PROJECT MANAGER KEVIN ARMSTRONG
MANAGING OFFICE DES MOINES, IOWA
PROJECT MIDAMERICAN ENERGY COMPANY WALTER SCOTT JR. ENERGY CENTER COUNCIL BLUFFS, IOWA
TITLE HYDROGEOLOGIC CROSS SECTION D-D'
MWH
FIGURE 9
REVISION
FILE NAME

MWH

Drilling Log

Monitoring Well MW-5R

Project	*WSEC CCR Monofill*	Owner	*MidAmerican Energy Company*
Location	*18236 Applewood Rd, Council Bluffs, IA*	Project Number	
Surface Elev.	*981.05 ft*	North *437777.012*	East *998168.83*
Top of Casing	*981.05 ft*	Water Level Initial ▽*952.574* 03/17/08 15:55	Static ▼*952.644* 03/20/08 09:53
Hole Depth	*32.0ft*	Screen: Diameter *2 in* Length *10.0 ft*	Type/Size *PVC/0.01 in*
Hole Diameter	*8.0 in*	Casing: Diameter *2 in* Length *22.0 ft*	Type *PVC*
Drill Co.	*Thiele Geotech*	Drilling Method	*Hollow Stem Auger/24-inch split spoon*
Driller	*J. Carmen*	Driller Reg. # *7801*	Log By *A. Shawda*
Start Date	*3/17/2008*	Completion Date *3/17/2008*	Checked By *K. Armstrong*

COMMENTS
Filter pack is Unimin 20/40 Filter Sil sand.
added during soil boring and well completion activities due to heavying sands.

Legend: Bentonite Grout; Bentonite Granules; Grout; Portland Cement; Sand Pack; Sand Pack

Depth (ft)	None (ppm)	% Recovery	Blow Count Recovery	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Elevation (ft)
0			5, 4	SP SM	Sandy silt/silty sand, light brown, loose, moist, 2.0 to 3.0 phi grain size, well sorted, subrounded, greater than 95% quartz.	981.054
			3		Fill, limestone gravel, gravel is angular with varying diameters.	980
			4	SP SM	Same as sandy silt/silty sand as 0 to 0.75 feet bgs.	
2		100%	2	CL ML	Silty clay, olive gray, medium stiff, moist, medium plasticity.	
4		100%	5, 11, 14, 3, 6, 7	SP SM	Sandy silt/silty sand, light brown to light gray, loose, moist, same as 1.5 to 2.0 feet bgs.	978, 976
6		100%	7, 1	CH	Silty clay/clay, olive gray to dark gray, soft to crumbly, moist to dry, high plasticity.	
8		100%	9, 16, 25, 4	SP	Sand with minor silt, olive gray to yellowish orange, loose to medium dense, moist to dry, 1.5 to 2.5 phi grain size, well sorted, subrounded, sand composed of 95% quartz and 5% other rock fragments-black flecks with minor lignite banding.	974
			4, 5, 11	CH	Clay, dark gray, very stiff, dry to moist, high plasticity, fine sand bands at approximately 9.5 ft to 9.9 ft bgs, sand bands are dark gray, 2.0 to 3.0 phi grain size, well sorted, and composed of greater than 95% quartz.	972
10		100%	2, 3, 6, 10		Same as 8.5 to 10 feet bgs with 0.25 inch sand band at 11.25 feet bgs, very stiff to hard, dry to moist, with minor organic material composed of roots, wood, and etc.	970
12		100%	3, 6		Same as 10 to 12 feet bgs, but medium stiff.	
			10		Same as 12 to 12.75 but hard to very stiff.	968
14		100% / 100%	14, 2, 9	SP SM	Sandy silt, dark gray, loose/crumbly, dry to moist, non-plastic, well sorted, 2.5 to 3.5 phi grain size, sand composed of greater than 95% quartz, straw inbedded.	

Continued Next Page

Drilling Log

Monitoring Well **MW-5R**

Project: *WSEC CCR Monofill* Owner: *MidAmerican Energy Company*

Location: *18236 Applewood Rd, Council Bluffs, IA* Project Number:

USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.
	Continued
ML	Silt, dark gray, loose/crumbly, dry, non-plastic.
CH	Clay, dark gray, soft, moist, high plasticity, still has pieces of straw embedded.
	Clay, light gray with light brown veining grading to light brown color with light gray mottles, medium stiff to soft with depth, moist, high plasticity
	Same light brown clay, but no mottles, getting softer with depth, moist to wet at 20 ft with trace of 2.5 to 3.5 phi sand, sand composed of greater than 95% quartz.
	Clay, light gray with light brown mottles, soft, moist, high plasticity.
ML	Silt with trace sand, light gray to olive gray, loose/crumbly, moist, no plasticity.
SP	Sand, yellowish orange, loose, moist to dry, 2.5 to 3.5 phi grain size, well sorted, subrounded, sand composed of greater than 95% quartz and 5% other rock fragments - black flecks.
SP SM	Same as 22.5 to 24 but wet at approximately 25 ft bgs, minor silt matrix.
	Sand, light brown, wet, same as 25 to 26 ft bgs.
	Same as 26 to 28 ft bgs, sand with silt, wet, 1.5 to 2.5 phi grain size, well sorted, black flecks-lignite.
SP	Sand, olive gray to dark gray, loose, wet, 1.0 to 2.0 phi grain size, well sorted, subrounded, sand composed of 95% quartz and 5% rock fragments - black flecks.
	End of boring = 32 feet bgs.

Depth (ft): 16, 18, 20, 22, 24, 26, 28, 30, 32, 34

% Recovery: 100%, 100%, 100%, 100%, 100%, 75%, 100%, 100%, 100%

Blow Count Recovery: 13, 9, 2, 3, 5, 6, 1, 2, 2, 3, 0, 2, 2, 3, 1, 6, 9, 9, 3, 5, 5, 8, 2, 5, 5, 7, 1, 2, 3, 5, 1, 3, 7, 10

Elevation (ft): 966, 964, 962, 960, 958, 956, 954, 952, 950, 948

Column headings: Depth (ft) | None (ppm) | % Recovery | Blow Count Recovery | Graphic Log | USCS | Description | Well Completion | Elevation (ft)

Drilling Log CBEC HIR 08-2006 SOUTH.GPJ MWH IA.GDT 2/25/09

Drilling Log

MWH

Monitoring Well **MW-11**

Project WSEC CCR Monofill   Owner MidAmerican Energy Company
Location 18236 Applewood Rd, Council Bluffs, IA   Project Number
Surface Elev. 969.74 ft   North 442762.719   East 995788.54
Top of Casing 973.12 ft   Water Level Initial ∇955.474 03/17/08 12:18   Static ▼956.334 03/20/08 08:10
Hole Depth 22.0ft   Screen: Diameter 2 in   Length 10.0 ft   Type/Size PVC/0.01 in
Hole Diameter 8.0 in   Casing: Diameter 2 in   Length 12.0 ft   Type PVC
Drill Co. Thiele Geotech   Drilling Method Hollow Stem Auger/24-inch split spoon
Driller J. Carmen   Driller Reg. # 7801   Log By A. Shawda
Start Date 3/17/2008   Completion Date 3/17/2008   Checked By K. Armstrong

COMMENTS
Filter pack is Unimin 20/40 Filter Sil sand. Top of casing cut down 0.37 ft from the initial depth to water measurement, value presented has been corrected.

Bentonite Grout   Bentonite Granules   Grout   Portland Cement   Sand Pack   Sand Pack

Depth (ft)	None (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
0			6, 5			Topsoil/loam, light brown, dry to moist, loose, no plasticity.		969.739
			4, 4			Sand, yellowish orange to light gray, dry, loose, 2.0 to 3.0 phi sized sand, well sorted, subrounded.		968
2		100%	1, 4, 4, 8					
4		100%	1, 4, 5, 6		SP	Same sand as above but 1.5 to 2.5 phi grain size.		966
6		100%			CH	Clay, light gray, moist, soft, medium to high plasticity, with wood fragments.		964
			2, 5, 3, 3					
8		100%	1, 3, 2, 3		SP	Sand, yellowish orange to light gray, dry to 7.5 feet then moist, loose, 1.5 to 2.5 phi grain size, well sorted, subrounded, sand composed of 95% quartz and 5% Rock fragments-reds, oranges, black flecks.		962
10		100%	1, 2, 3, 3					960
12		100%						958

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Drilling Log

MWH

Monitoring Well **MW-11**

Project: *WSEC CCR Monofill* — Owner: *MidAmerican Energy Company*

Location: *18236 Applewood Rd, Council Bluffs, IA* — Project Number:

Depth (ft)	None (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
						Continued		
12			1, 3					
			3		SP	Sand, dark gray to black, moist to wet, loose, with lignite, 1.0 to 2.0 phi, well sorted.		
						Same as 12.75 to 13.25 with more iron bands.		
14		100%	2			Sand, yellowish orange to light gray, wet, loose, 1.0 to 2.5 phi, well sorted, subrounded, minor silt matrix.		956
			1, 2			Same wet loose sand as 13.5 to 14 ft, sand composed of 90% quartz and 10% other rock fragments, more lignite present.		
			2			Silty/ash layers, light gray to dark gray, slight blue coloring, wet, very soft, no plasticity, broad odor, wood fragments and ash mixed in.		
16		75%	3			No recovery.		954
			3, 3, 4		SP	Sand, light gray to olive gray, wet, loose, 1.5 to 2.5 phi, well sorted, subrounded, sand composed of 90% quartz and 10% other rock fragments-black flecks, <10% silt matrix.		
18		100%	4, 1, 2					952
			3			Poorly sorted sand, wet, loose, -1.0 to 2.0 phi grain size, subrounded, sand composed of reds, oranges, and black grains.		
20		75%	5, 3, 2		SW	Same as 19 to 19.5 feet bgs, sand, poorly sorted, varying color sand, minor light gray silt matrix, subrounded to subangular, reds, blacks, blues, greens, oranges, yellow and lignite pieces, -1.0 phi and bitter to 2.0 phi grain size, wet, loose.		950
22		50%	4, 3					948
						End of boring = 22 feet bgs.		
24								946
26								944
28								942

Drilling Log

MWH

Monitoring Well **MW-12**

COMMENTS
Filter pack is Unimin 20/40 Filter Sil sand.

Project	*WSEC CCR Monofill*
Owner	*MidAmerican Energy Company*
Location	*18236 Applewood Rd, Council Bluffs, IA*
Project Number	
Surface Elev.	*977.62 ft*
North	*441957.079*
East	*998711.403*
Top of Casing	*980.50 ft*
Water Level Initial	▽*957.612* 03/18/08 15:10
Static	▼*957.612* 03/18/08 15:10
Hole Depth	*30.0ft*
Screen: Diameter	*2 in*
Length	*10.0 ft*
Type/Size	*PVC/0.01 in*
Hole Diameter	*8.0 in*
Casing: Diameter	*2 in*
Length	*20.0 ft*
Type	*PVC*
Drill Co.	*Thiele Geotech*
Drilling Method	*Hollow Stem Auger/24-inch split spoon*
Driller	*J. Carmen*
Driller Reg. #	*7801*
Log By	*A. Shawda*
Start Date	*3/18/2008*
Completion Date	*3/18/2008*
Checked By	*K. Armstrong*

Bentonite Grout | Bentonite Granules | Grout | Portland Cement | Sand Pack | Sand Pack

Depth (ft)	None (ppm)	% Recovery	Blow Count Recovery	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Elevation (ft)
0		100%	13, 17, 8, 9		Fill, yellowish orange and light brown, hard, dry, crumbly, no plasticity.	977.617
2		100%	6, 43, 29, 13		Fill, dark gray to olive gray with greenish gray mottles, hard, dry, crumbly, no plasticity.	976
4		100%	16, 11		Fill/silt, yellowish orange to light brown, loose, dry, crumbly, no plasticity.	974
			10		Same as 3.75 to 4.5 but light brown.	
6		100%	28		Fill, dark gray to olive gray, hard crumbly, no plasticity.	972
			6, 7		Fill, yellowish brown, loose, dry, no plasiticy.	
			19		Fill, dark gray, looe, dry, no plasticity.	
8		100%	4, 1, 3, 4, 3		Silty clay/fill mix, greenish gray, moist, no plasticity.	970
10		100%	1	CL ML	Silty clay to silt, light gray, soft, moist, no plasticity.	968
			4, 9, 4	ML	Silt, light gray, crumbly, moist to dry with depth, no plasticity.	966
12		100%	2, 3, 4, 5	CL ML	Silty clay, light brown, soft to medium stiff, moist, low plasticity. At 14ft bgs, clay to silty clay, light brown to dark gray, medium stiff to stiff, dry to moist, medium plasticity.	964
14		75%	1	CH	Clay, dark gray to light brown, soft, moist, high plasticity.	
			4, 7, 10	SP	Sand, yellowish orange, loose, dry, 2.0-3.0 phi grain size, well sorted, subrounded, sand composed of greater than 95% quartz and less than 5% other rock fragments - black flecks.	962
16		100%	3, 8, 9, 15		Same sand as 14.5ft to 16.0 ft bgs, grading to yellowish orange to light brown with slight moisture at 17.75ft to 18 feet bgs.	960
18		100%	8, 11, 13, 18		Same sand, increasing moisture with depth - moist to wet at 20 ft bgs, also increase in grain size to 1.5 to 2.5 phi.	958
20		100%				

Continued Next Page

MWH

Drilling Log

Monitoring Well **MW-12**

Project WSEC CCR Monofill

Owner MidAmerican Energy Company

Location 18236 Applewood Rd, Council Bluffs, IA

Project Number

Depth (ft)	None (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
						Continued		
20		100%	2, 7, 11, 12		SP	Same sand, moist to wet.		
22		100%	1, 4, 4, 4		SP	Sand, light brown to olive gray, loose, wet, 1.5 to 2.5 phi grain size, well sorted, subrounded, sand composed of 95% quartz and 5% other rock fragments - black flecks.		956
24		100%	1, 3, 3, 5		SP	Sand, olive gray, loose to medium dense, wet, 1.5 to 2.5 phi grain size, well sorted, subrounded, sand composed of 95% quartz and 5% rock fragments - black flecks.		954
26		100%	2, 2, 5, 6		SP SM	Silty sand/sand silt, olive gray to dark gray, loose to medium dense, wet, 2.0 to 3.0 phi grain size, well sorted, sand composed of 90% quartz and 10% rock fragments - black flecks, no plasticity.		952
28		100%	3, 6, 6, 8		SP SM			950
30						End of boring = 30 feet bgs.		948
32								946
34								944
36								942
38								940
40								938
42								936
44								934
46								932

Drilling Log

Monitoring Well **MW-13**

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Project	WSEC CCR Monofill	Owner	MidAmerican Energy Company
Location	18236 Applewood Rd, Council Bluffs, IA	Project Number	
Surface Elev.	968.61 ft	North	439123.389
East	1000757.67	Top of Casing	971.50 ft
Water Level Initial	∇961.154 (03/19/08 11:14)	Static	
Hole Depth	16.0ft	Screen: Diameter	2 in
Length	10.0 ft	Type/Size	PVC/0.01 in
Hole Diameter	8.0 in	Casing: Diameter	2 in
Length	6.0 ft	Type	PVC
Drill Co.	Thiele Geotech	Drilling Method	Hollow Stem Auger/24-inch split spoon
Driller	J. Carmen	Driller Reg. #	7801
Log By	A. Shawda	Start Date	3/19/2008
Completion Date	3/19/2008	Checked By	K. Armstrong

COMMENTS
Filter pack is Unimin 20/40 Filter Sil sand.

Legend: Bentonite Grout; Bentonite Granules; Grout; Portland Cement; Sand Pack; Sand Pack

Depth (ft)	None (ppm)	% Recovery	Blow Count Recovery	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Elevation (ft)
0		100%	5, 7, 13, 13	CL ML	Silt to silty clay, light brown with organic material, loose to soft and crumbly, moist, low to no plasticity, roots and etc.	968.606
					Same as 0-0.5 feet but dry.	968
1.5				ML	Silt, light gray, crumbly, moist to dry, no plasticity, organic matter, roots and etc.	
2		100%	6, 8, 8, 10	CL ML	Silty clay, light brown to olive gray, soft to crumbly, moist, low plasticity.	966
4		100%	1, 1, 2, 3			964
6		100%	2, 4, 5, 8	SP	Sand, yellowish orange to light brown, loose, dry to moist, 1.5 to 2.5 phi grain size, well sorted, subrounded, sand composed of greater than 95% quartz and less than 5% rock fragments -black lignite flecks.	962
					Same sand as 5.9-6.0 ft bgs, with 6 ft to 7 ft bgs moist, 7 ft to 7.5 ft bgs moist to wet, and 7.5 to 7.75 ft bgs wet.	∇
8		100%	3, 4, 4, 3		Same wet sand as 7.5 to 7.75 feet bgs with red rock fragments as well as black flecks, lignite layer/band at 14 ft bgs.	960
10		100%	1, 2, 3, 4			958
12		100%	1, 3, 5, 6			956
14		100%	1, 4, 8, 16		Same wet sand as 8-14 feet but increase in lignite flecks - very few red flecks and color olive gray, sand composed of 90% quartz and 10% other rock fragments - lignite flecks.	954
16		100%			End of boring = 16 feet bgs.	952
18						950

Drilling Log

MWH

Monitoring Well **MW-14**

Project: *WSEC CCR Monofill* — Owner: *MidAmerican Energy Company*
Location: *18236 Applewood Rd, Council Bluffs, IA* — Project Number:
Surface Elev. *968.24 ft* — North *438598.96* — East *998425.105*
Top of Casing *971.18 ft* — Water Level Initial ▽*957.211* 03/19/08 17:00 — Static ▼
Hole Depth *18.0ft* — Screen: Diameter *2 in* — Length *10.0 ft* — Type/Size *PVC/0.01 in*
Hole Diameter *8.0 in* — Casing: Diameter *2 in* — Length *7.5 ft* — Type *PVC*
Drill Co. *Thiele Geotech* — Drilling Method *Hollow Stem Auger/24-inch split spoon*
Driller *J. Carmen* — Driller Reg. # *7801* — Log By *A. Shawda*
Start Date *3/19/2008* — Completion Date *3/19/2008* — Checked By *K. Armstrong*

COMMENTS
Filter pack is Unimin 20/40 Filter Sil sand.

Legend: Bentonite Grout, Bentonite Granules, Grout, Portland Cement, Sand Pack, Sand Pack

Depth (ft)	None (ppm)	% Recovery	Blow Count Recovery	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Elevation (ft)
0			2, 2, 4, 5	CL ML	Silt/silty clay, light brown, stiff to very stiff, moist to wet from 0.0 ft to 0.5 ft bgs and then moist, medium to low plasticity, organic materials - roots, grass, and etc.	968.239 / 968
2		75%	1		Silty clay, light brown, soft, moist, medium plasticity, few roots.	966
			3, 6, 7, 1, 3, 4	CH	Clay, light gray, very stiff, moist, roots.	
4		75%				964
			7	ML	Silt with minor fine sand, light brown to yellowish orange, soft, wet, no plasticity.	
6		100%	5, 7, 7		Sand, yellowish orange, loose, dry to moist, 2.5 to 3.5 phi grain size, well sorted, subrounded, sand composed of greater than 95% quartz and less than 5% rock fragments - black flecks and reds.	962
8		100%	11, 5, 6, 6		Sand, yellowish orange to light gray, loose, dry to slightly moist with increased moisture at 8 ft bgs, 2.5 to 3.5 phi grain size, sand composed of greater than 95% quartz and less than 5% rock fragments - black flecks and reds.	960
10		100%	5, 1	SP		958
▽			2, 3, 4		Sand, light brown to yellowish orange, loose, wet, 2.0 to 3.0 phi grain size, well sorted, subrounded, sand composed of 95% quartz and 5% rock fragments - black flecks.	▽
12		100%	2			956
			4	CH	Clay, light gray, stiff to medium stiff, wet, high plasticity.	
			5, 7		Sand, light brown to yellowish orange, loose, wet, 2.0 to 3.0 phi grain size, well sorted, subrounded, sand composed of 95% quartz and 5% rock fragments - black flecks.	
14		100%	3, 6, 8	SP		954
16		100%	11, 3, 6, 6			952
18		100%	27			950
					End of boring = 18 ft bgs.	
20						

MWH

Drilling Log

Monitoring Well **MW-15**

Project: WSEC CCR Monofill | Owner: MidAmerican Energy Company

Location: 18236 Applewood Rd, Council Bluffs, IA | Project Number:

Surface Elev.: 969.30 ft | North: 439413.861 | East: 995380.072

Top of Casing: 971.96 ft | Water Level Initial: ▽ | Static: ▼949.394 04/10/08 09:44

Hole Depth: 24.0ft | Screen: Diameter 2 in | Length 10.0 ft | Type/Size PVC/0.01 in

Hole Diameter: 8.0 in | Casing: Diameter 2 in | Length 14.0 ft | Type PVC

Drill Co.: Thiele Geotech | Drilling Method: Hollow Stem Auger/24-inch split spoon

Driller: D. Mathers | Driller Reg. #: 7892 | Log By: K. Wilhelm

Start Date: 4/9/2008 | Completion Date: 4/9/2008 | Checked By: K. Armstrong

COMMENTS
Filter pack is Unimin 20/40 Filter Sil sand.

Legend: Bentonite Grout | Bentonite Granules | Grout | Portland Cement | Sand Pack | Sand Pack

USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.
	Topsoil, fine sandy silt, dark brown, soft moist, predominantly fine sand, medium plasticity with pieces of wood/tree roots.
SP	Poorly graded sand, yellowish orange to light gray, soft, moist, fine grained sand (2.0 to 2.5 phi), non plastic. No recovery from 1.5 to 2.0 ft bgs.
SP SM	Silty sand, olive gray, loose, dry, fine grained sand (2.5 to 3.0 phi), low plasticity, some roots.
	No recovery.
SP SM	Poorly graded silty sand, yellowish orange to light gray, very loose, dry, fine grained sand (2.5 to 3.0 phi) non plastic.
CL ML	Silty clay, olive gray, very soft, moist, medium plasticity, orange-brown criss-crossing fien roots.
SP SM	Sandy silt, light gray with dark orange brown mottling, very soft, moist, predominantly fine grained sand, low plasticity.
	No recovery.
SP SM	Silty sand, light gray with orange mottling, very loose, dry, fine grained sand (2.5 to 3.0 phi), non plastic.
SP	Poorly graded sand, yellowish orange to light gray, very loose, dry, predominantly fine grained sand (2.5 to 3.0 phi), non plastic.
	No recovery
SP	Poorly graded sand, yellowish orange to light gray, loose, dry, predominantly fine grained sand (2.0 to 2.5 phi) non plastic.
	No recovery.
SP	Same sand as 10 to 11.5 ft bgs.
	No recovery.

Depth (ft): 0, 2, 4, 6, 8, 10, 12, 14

% Recovery: 75%, 63%, 67%, 75%, 88%, 75%, 75%

Blow Count Recovery: 4, 3, 4, 4, 4, 3, 4, 4, 2, 2, 4, 6, 2, 2, 3, 4, 3, 4, 5, 4, 2, 5, 3, 4, 3, 3, 5, 3

Elevation (ft): 969.296, 968, 966, 964, 962, 960, 958, 956

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Drilling Log

MWH

Monitoring Well **MW-15**

Project *WSEC CCR Monofill* Owner *MidAmerican Energy Company*

Location *18236 Applewood Rd, Council Bluffs, IA* Project Number

Depth (ft)	None (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
						Continued		
14			2, 3, 3		SP	Poorly graded sand, yellowish orange to light gray, very loose, dry, predominantly fine sand (2.0 to 2.5 phi), non plastic.		
			2			Poorly graded sand, light gray to dark gray, very loose, dry, predominantly fine sand (2.0 to 2.5 phi), non plastic.		954
16		88%				No recovery.		
					SP	Same sand as 15.25 ft to 15.75 ft bgs, but moist.		
						Same sand as 16 ft to 17 ft bgs, but wet.		952
18		100%	1, 1					
			1		CL ML	Silty clay, dark gray, very soft, moist, medium plasticity.		950
			1		SP SM	Sandy silt, dark gray, very soft, wet, fine grained sand, low plasticity.		
20		100%	6, 2, 2, 2		SP	Poorly graded sand, dark gray, very loose, fine sand (1.5 to 2.5 phi), non plastic.		948
22		100%	1, 1, 1, 2		SP SM	Silty sand, dark gray, very loose, wet, fine sand, non plastic.		946
24		75%						
						End of boring = 24 ft bgs.		944
26								942
28								940
30								938
32								

Drilling Log

MWH

Monitoring Well **MW-16**

Project: *WSEC CCR Monofill*
Owner: *MidAmerican Energy Company*
Location: *18236 Applewood Rd, Council Bluffs, IA*
Project Number:
Surface Elev.: *968.43 ft* North: *439673.68* East: *995208.05*
Top of Casing: *971.48 ft* Water Level Initial ∇ Static ▼
Hole Depth: *20.0ft* Screen: Diameter *2 in* Length *10.0 ft* Type/Size *PVC/0.01 in*
Hole Diameter: *8.0 in* Casing: Diameter *2 in* Length *10.0 ft* Type *PVC*
Drill Co.: *Thiele Geotech* Drilling Method: *Hollow Stem Auger/24-inch split spoon*
Driller: *D. Mathers* Driller Reg. #: *7892* Log By: *K. Wilhelm*
Start Date: *4/9/2008* Completion Date: *4/9/2008* Checked By: *K. Armstrong*

COMMENTS
Filter pack is Unimin 20/40 Filter Sil sand.

Legend: Bentonite Grout | Bentonite Granules | Grout | Portland Cement | Sand Pack | Sand Pack

Depth (ft)	None (ppm)	% Recovery	Blow Count Recovery	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Elevation (ft)
0		100%	0, 1, 2, 2		No Recovery	968.433 / 968
2		67%	2, 2, 4, 6	SC	Fine sandy clay, light brown to olive gray, medium stiff, moist, mediuim plasticity.	966
4		40%	2, 2, 2, 2	SP SM	Silty sand, ligh brown, very loose, moist to dry non plastic, fine grained sand, 1 piece of wood.	964
6		63%	1	CL ML	Silty clay, light brown to olive gray, soft, moist, medium plasticity.	
			2	SP SM	Silty sand, light brown to olive gray, moist to dry, non plastic.	962
			2	CL ML	Silty clay, light brown to olive gray, soft, moist, medium plasticity.	
			4	SP SM	Silty sand, yellowish brown, fine grained sand, non plastic.	
					No recovery.	
8		25%	1	CL ML	Silty clay, light orange to olive gary, soft, moist, medium to high plasticity, orange to brown fine roots.	960
			2, 3, 2		No recovery.	
10		75%	0	CL ML	Silty clay, light brown to olive gray, soft, moist, medium plasticity.	
			2	SP SM	Silty sand, light gray to dark gray, dry, fine graine sand, non plastic.	958
			2	CL ML	Silty clay, dark gray, soft, moist, medium plasticity.	
			2		No recovery.	
12		38%	0	CL ML	Same silty clay as 10.75 to 11.5 feet bgs, with wood fibers.	956
			1, 1, 1		No recovery.	
14						

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MWH

Drilling Log

Monitoring Well **MW-16**

Project WSEC CCR Monofill
Owner MidAmerican Energy Company

Location 18236 Applewood Rd, Council Bluffs, IA
Project Number

Depth (ft)	None (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
						Continued		
14			0, 0		ML	Fine sandy silt, olive gray to dark gray, soft, wet, low plasticity, 1 shell.		954
		75%	1, 2		CL ML	Silty clay, olive gray to dark gray, medium stiff, moist to wet, high plasticity, thin layer of fine silty sand, same color.		
16			0, 1		SP SM	Silty fine sand, olive gray to dark gray, moist, non plastic.		952
		50%	2, 8			No recovery.		
18		63%	5, 11, 11, 9		SP	Poorly graded sand, olive gray to light gray, dry to moist, fine grained sand, non plastic.		950
20								948
						End of boring = 20 feet bgs.		
22								946
24								944
26								942
28								940
30								938
32								936

Drilling Log

MWH

Monitoring Well **MW-17**

Project WSEC CCR Monofill
Owner MidAmerican Energy Company
Location 18236 Applewood Rd, Council Bluffs, IA
Project Number
Surface Elev. 968.48 ft North 439919.828 East 995066.048
Top of Casing 971.19 ft Water Level Initial ∇ Static ▼
Hole Depth 20.0ft Screen: Diameter 2 in Length 10.0 ft Type/Size PVC/0.01 in
Hole Diameter 8.0 in Casing: Diameter 2 in Length 10.0 ft Type PVC
Drill Co. Thiele Geotech Drilling Method Hollow Stem Auger/24-inch split spoon
Driller D. Mathers Driller Reg. # 7892 Log By K. Wilhelm
Start Date 4/9/2008 Completion Date 4/9/2008 Checked By K. Armstrong

COMMENTS
Filter pack is Unimin 20/40 Filter Sil sand.

Bentonite Grout | Bentonite Granules | Grout | Portland Cement | Sand Pack | Sand Pack

Depth (ft)	None (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
								968.482
0			2		SP SM	Poorly graded silty sand, light brown to olive gray, very loose, moist, fine sand (1.5 to 2.5 phi) with trace fine subangular gravel, non plastic.		968
			1, 1, 2			No recovery.		
2		25%	2		SP SC	Sandy clay to clayey sand, olive gray to dark gray, very soft, moist, fine sand with trace subrounded gravel, low plasticity.		966
			2		CL	Clay, dark gray, medium stiff, dry to moist, high plasticity, orange brown on ped faces.		
			6, 6			No recovery.		
4		63%	2		SC	Sandy clay, olive gray to dark gray, very soft, moist, fine grained sand, low plasticity, trace wood.		964
			2, 3		SP	Poorly graded sand, light brown to light gray, very loose, dry, fine sand (1.5 to 2.5 phi), non plastic.		
			3			No recovery.		
6		75%			SC	Sandy clay, olive brown, soft, dry to moist, medium plasticity, orange brown in fine fractures.		962
			2, 4, 6		SP	Poorly sorted sand, yellowish brown to light gray, loose, dry, fine grained sand (1.5 to 2.5 phi), non plastic.		
			7			No recovery.		
8		75%	1, 4, 2		SP SM	Silty sand, olive gray to dark gray, soft, moist fine grained sand (2.5 to 3.0 phi), non plastic.		960
			3			No recovery.		
10		75%						

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MWH

Drilling Log

Monitoring Well **MW-17**

Project *WSEC CCR Monofill* Owner *MidAmerican Energy Company*

Location *18236 Applewood Rd, Council Bluffs, IA* Project Number

Depth (ft)	None (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
						Continued		
10			0, 1, 1, 2		SM	Sandy silt, olive gray to dark gray, very soft, moist, fine grained sand, low plasticity.		958
						No recovery.		
12		88%	0, 0, 0		CL ML	Clayey silt to silty clay, olive gray to dark gary, very soft, moist to wet at 13 feet bgs, low to medium plasticity.		956
14		75%	1, 0, 0, 0, 0					954
16		100%	0, 0					952
			1, 1			No recovery.		
18		38%	0, 1, 2		CL ML	Silty clay, olive gray to dark gary, soft, moist, high to medium plasticity with then layers of fine to coarse sand with shells.		950
			2			No recovery.		
20		75%						948
						End of boring = 20 feet bgs.		
22								946

BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER	MW-1

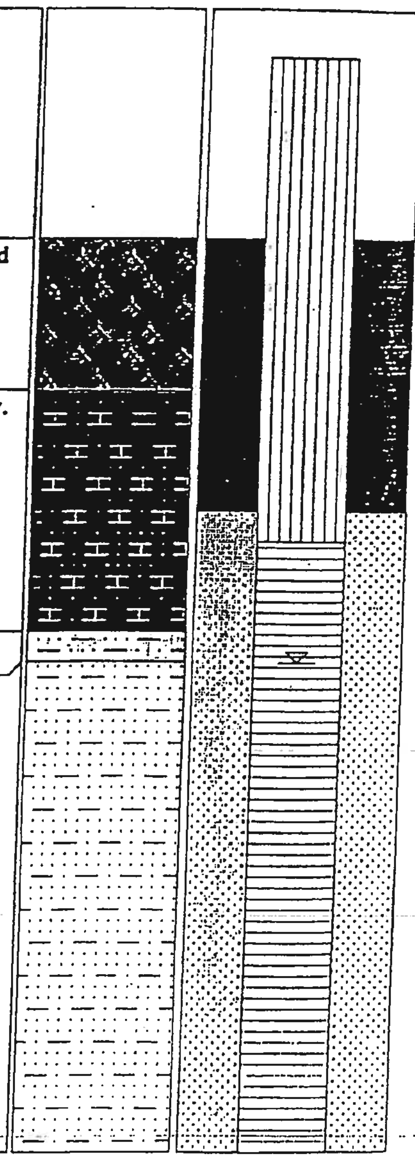
PROJECT NUMBER: MEC - Council Bluffs
PROJECT NAME: Ash Ponds Investigation
LOCATION: Council Bluffs, IA
DRILLING CO: Aquadrill
DRILLING METHOD: Hollow Stem Auger
FIELD PARTY: Auld, Dennis
GEOLOGIST: Eisen, Kevin
DATE BEGUN: 11/8/00 DATE COMPLETED: 11/8/00

FIELD BOOK NO: MEC - CB book 1
TOTAL DEPTH: 15'
GROUND SURFACE ELEVATION: 967.2'

STATIC WATER LEVEL (BGS)		
Depth (ft)		
Time		
Date		

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION
971.0							
970.0							
969.0							
968.0							
967.0							TOPSOIL: Brown silt/clay with roots and organics.
966.0			M				
965.0							CLAY AND SILT: Tan/gray silt and clay.
964.0							
963.0			M		-/-/100		
962.0							
961.0							
960.0			S		-/20/80		SANDY SILT: Tan/gray fine sandy silt.
959.0							SAND WITH SILT: Tan/gray fine sand with silt.
958.0					-/90/10		
957.0							
956.0							
955.0							
954.0					-/85/15		End of Boring at 15' bgs. Screened interval 5 - 15' bgs. Protective riser and expandable well cap installed.
953.0							

LITHOLOGY / WELL INSTALLATION



BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER: MW-2

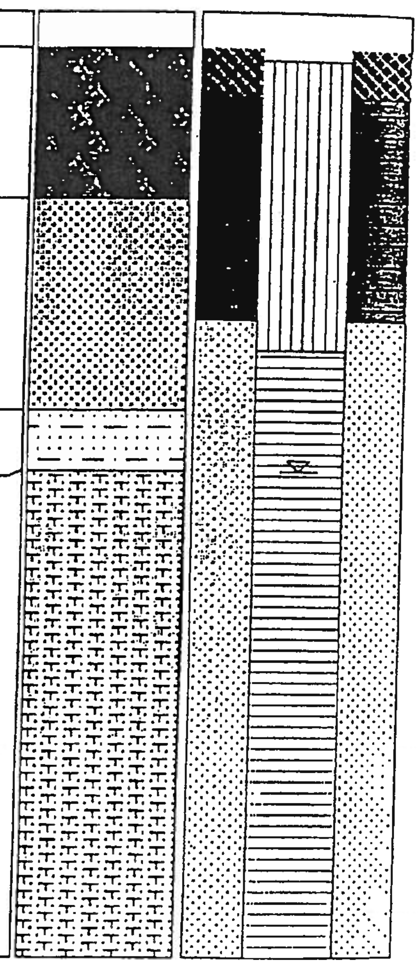
PROJECT NUMBER: MEC - Council Bluffs
PROJECT NAME: Ash Ponds Investigation
LOCATION: Council Bluffs, IA
DRILLING CO: Aquadrill
DRILLING METHOD: Hollow Stem Auger
FIELD PARTY: Auld, Dennis
GEOLOGIST: Eisen, Kevin
DATE BEGUN: 11/8/00 DATE COMPLETED: 11/8/00

FIELD BOOK NO: MEC - CB book 1
TOTAL DEPTH: 15'
GROUND SURFACE ELEVATION: 968.4'

STATIC WATER LEVEL (BGS)		
Depth (ft)		
Time		
Date		

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION
969.0							
968.0							TOPSOIL: Tan/brown silt/clay with organics.
967.0			D/M				
966.0							
965.0							FINE SAND: Tan very fine sand (possibly fill).
964.0			D		-/100/-		
963.0							
962.0					-/95/5		SAND WITH SILT: Tan/brown very fine sand with silt.
961.0			S				SILTY SAND: Gray/brown silty fine sand.
960.0							
959.0							
958.0							
957.0							
956.0							6" of gray/brown silt w/ clay and silt at 13' bgs.
955.0							End of Boring at 15' bgs. Screened interval 5 - 15' bgs. Flush-mount cover and expandable well cap installed.
954.0							

LITHOLOGY / WELL INSTALLATION



BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER	MW-3

PROJECT NUMBER: MEC - Council Bluffs
PROJECT NAME: Ash Ponds Investigation
LOCATION: Council Bluffs, IA
DRILLING CO: Aquadrill
DRILLING METHOD: Hollow Stem Auger
FIELD PARTY: Auld, Dennis
GEOLOGIST: Eisen, Kevin
DATE BEGUN: 11/10/00 DATE COMPLETED: 11/10/00

FIELD BOOK NO: MEC - CB book 1
TOTAL DEPTH: 13'
GROUND SURFACE ELEVATION: 968.4'

STATIC WATER LEVEL (BGS)		
Depth (ft)		
Time		
Date		

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION	LITHOLOGY	WELL INSTALLATION
969.0									
968.0							TOPSOIL: Brown silt to sandy silt with organics.		
967.0			M						
966.0							CLAY AND SILT: Brown to gray/brown silt/clay.		
965.0									
964.0			M						
963.0					-/70/30 -/15/85		SANDY SILT: Brown/gray sandy silt. 3" of brown silty sand at 5' bgs. Water table at 5.5' bgs.		
962.0			S						
961.0							CLAY AND SILT: Gray/brown clayey silt.		
960.0			S				SANDY SILT: Gray/brown clayey silt with sand.		
959.0					-/15/85		SILTY SAND: Gray/brown silty sand.		
958.0					-/85/15				
957.0							1" silt/clay lens at 11.4' bgs.		
956.0			S				SANDY SILT: Gray sandy silt/clay.		
955.0							End of Boring at 13' bgs. Screened interval 3-13' bgs. Flush-mounted cover and expandable well cap installed.		
954.0									

BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER	MW-4A

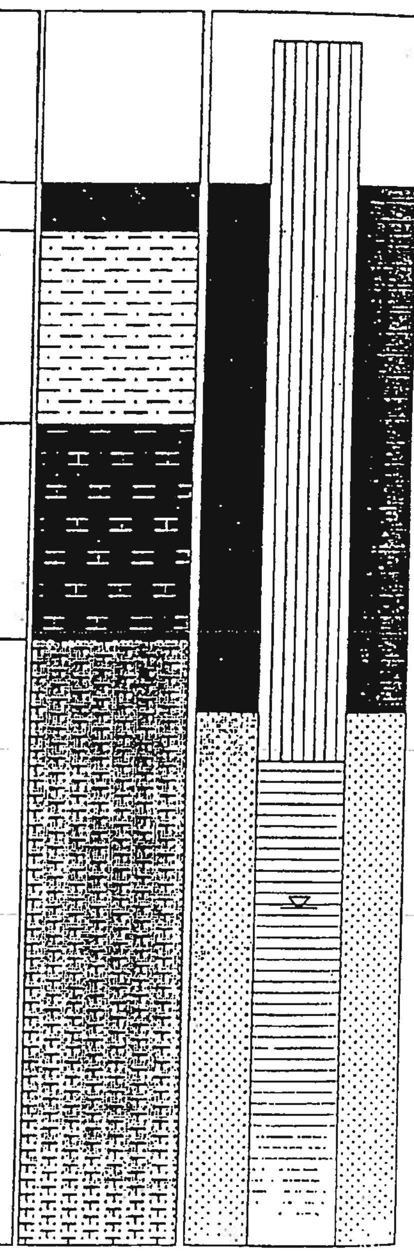
PROJECT NUMBER: MEC - Council Bluffs
PROJECT NAME: Ash Ponds Investigation
LOCATION: Council Bluffs, IA
DRILLING CO: Aquadrill
DRILLING METHOD: Hollow Stem Auger
FIELD PARTY: Auld, Dennis
GEOLOGIST: Eisen, Kevin
DATE BEGUN: 11/9/00 DATE COMPLETED: 11/10/00

FIELD BOOK NO: MEC - CB book 1
TOTAL DEPTH: 45'
GROUND SURFACE ELEVATION: 974.4'

STATIC WATER LEVEL (BGS)		
Depth (ft)		
Time		
Date		

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION
978.0							
977.0							
976.0							
975.0							
974.0							TOPSOIL: Brown silt with organics.
973.0			D/M				SILT WITH SAND: Tan/brown silt with 5-10% fine to coarse sand.
972.0							
971.0					-/5/95		
970.0			D				
969.0							CLAY AND SILT: Brown/gray silt and clay.
968.0							
967.0			M				
966.0							Low-medium plasticity.
965.0							
964.0					-/70/30		SILTY SAND: Tan very fine to fine silty sand.
963.0					-/40/60		6" sandy silt at 11' bgs.
962.0			M				
961.0							
960.0					-/80/20		
959.0			S				Water table at 15'.
958.0							
957.0							
956.0							
955.0							Pilot Boring advanced to 45' bgs. MW-4A is screened 12-22' bgs. MW-4A is 6' North of MW-4B. Protective riser and expandable well cap installed.
954.0							
953.0							

LITHOLOGY / WELL INSTALLATION



BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER	MW-4B

PROJECT NUMBER: MEC - Council Bluffs
PROJECT NAME: Ash Ponds Investigation
LOCATION: Council Bluffs, IA
DRILLING CO: Aquadrill
DRILLING METHOD: Hollow Stem Auger
FIELD PARTY: Auld, Dennis
GEOLOGIST: Eisen, Kevin
DATE BEGUN: 11/9/00 DATE COMPLETED: 11/10/00

FIELD BOOK NO: MEC - CB book 1
TOTAL DEPTH: 45'
GROUND SURFACE ELEVATION: 974.6'

STATIC WATER LEVEL (BGS)		
Depth (ft)		
Time		
Date		

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION	LITHOLOGY	WELL INSTALLATION
978.0									
977.0									
976.0									
975.0									
974.0							TOPSOIL: Brown silt with organics.		
973.0			D/M				SILT WITH SAND: Tan/brown silt with 5-10% fine to coarse sand.		
972.0									
971.0					-/5/95				
970.0			D						
969.0							CLAY AND SILT: Brown/gray silt and clay.		
968.0									
967.0			M						
966.0							Low-medium plasticity.		
965.0							SILTY SAND: Tan very fine to fine silty sand.		
964.0					-/70/30				
963.0					-/40/60		6" sandy silt at 11' bgs.		
962.0			M				MW-4A is screened 12-22' bgs..		
961.0									
960.0					-/80/20				
959.0			S				Water table at 15' bgs.		
958.0									
957.0									
956.0									
955.0									

BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER: MW-4B

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION	LITHOLOGY	WELL CONSTRUCTION
955.0									
954.0			S						
953.0							As above. Tan silty fine sand.		
952.0					-/85/15				
951.0					-/80/20				
950.0									
949.0			S						
948.0									
947.0									
946.0					-/80/20				
945.0									
944.0			S						
943.0									
942.0					-/85/15				
941.0							SANDY SILT: Dark gray sandy silt with 5% gravel.		
940.0					5/15/80				
939.0			S				SILTY SAND: Tan/gray silty sand.		
938.0									
937.0							No recovery 35-40.		
936.0									
935.0									
934.0			S						
933.0									
932.0					-/80/20		2 silt lenses 1" thick each at 45' bgs.		
931.0							End of Pilot Boring at 45' bgs. MW-4B is screened 35-45' bgs. MW-4A is 6' North of MW-4B. Protective risers and expandable well caps installed on both.		
930.0									

BORING AND WELL CONSTRUCTION LOG

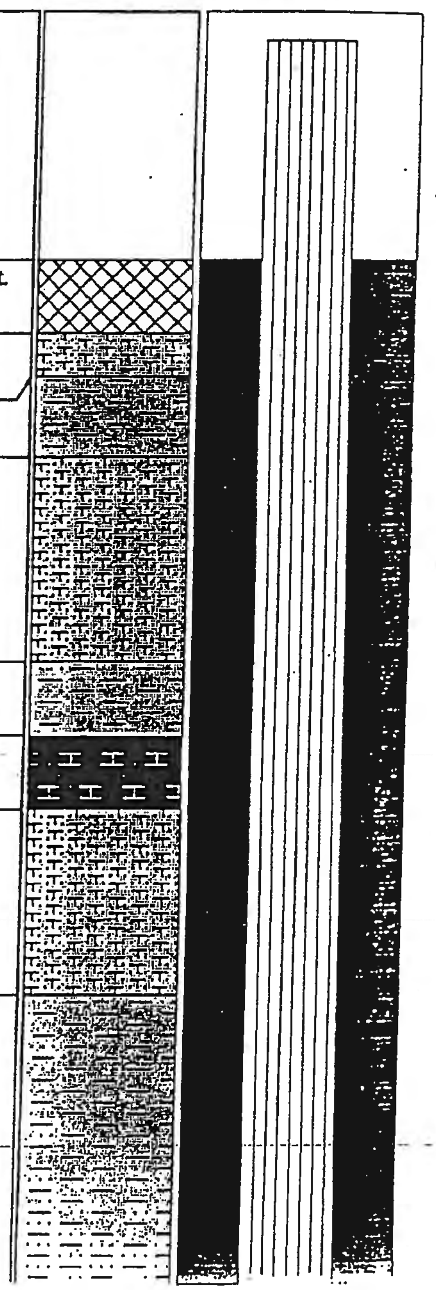
BOREHOLE NUMBER	MW-5

PROJECT NUMBER:	MEC - Council Bluffs	FIELD BOOK NO:	MEC - CB book 1
PROJECT NAME:	Ash Ponds Investigation	TOTAL DEPTH:	30'
LOCATION:	Council Bluffs, IA	GROUND SURFACE ELEVATION:	980.6'
DRILLING CO:	Aquadrill		
DRILLING METHOD:	Hollow Stem Auger		
FIELD PARTY:	Auld, Dennis		
GEOLOGIST:	Eisen, Kevin		
DATE BEGUN:	11/10/00	DATE COMPLETED:	11/10/00

STATIC WATER LEVEL (BGS)		
Depth (ft)		
Time		
Date		

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION
984.0							
983.0							
982.0							
981.0							
							FILL: Limestone aggregate and coal dust.
980.0							
							SILTY SAND: Brown silty very fine sand.
979.0							SANDY SILT: Brown sandy silt.
978.0							SILTY SAND: Tan/brown silty sand.
977.0							
976.0					-/60/40		
975.0							SANDY SILT: Gray sandy silt.
					-/30/70		
974.0							CLAY AND SILT: Gray clayey silt.
					-/-/100		
973.0							SILTY SAND: Brown silty sand.
972.0					-/80/20		
971.0							SANDY SILT: Gray/brown sandy silt/clay.
970.0							
969.0							
			M		-/15/85		Perched water above this unit.
968.0							
967.0							

LITHOLOGY | WELL INSTALLATION



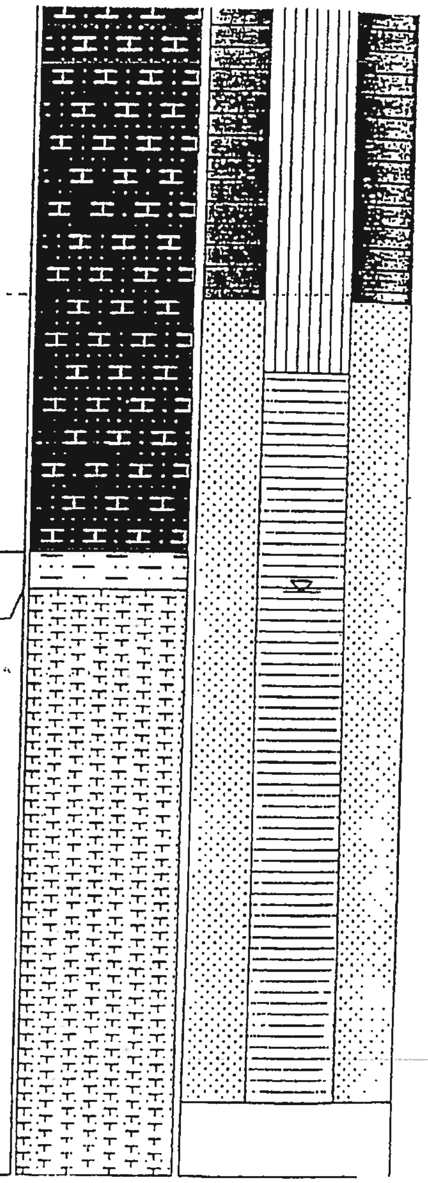
BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER	MW-5

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION
							CLAY AND SILT: Gray clayey silt.
966.0					-/-/100		
965.0							
964.0			M				Low plasticity. Stiff.
963.0					-/-/100		
962.0							
961.0							Medium stiffness. Medium plasticity.
960.0							
959.0							Organic thatch 1/4" thich at 21' bgs.
958.0							SANDY SILT: Tan sandy silt. Grades to below.
957.0			S		-/80/20		SILTY SAND: Tan silty very fine to fine sand.
956.0							Water table at 22' bgs.
955.0							
954.0							
953.0			S		-/75/25		
952.0							End of Boring at 30' bgs. Screened interval is 19-29' bgs. Protective riser and expandable well cap installed.
951.0							

LITHOLOGY

WELL CONSTRUCTION



BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER	MW-6A

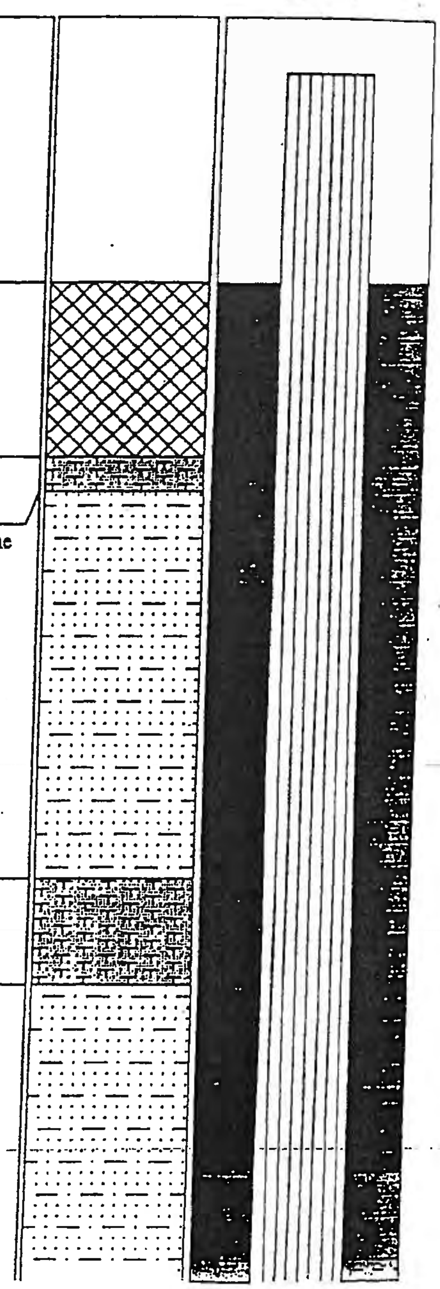
PROJECT NUMBER: MEC - Council Bluffs
PROJECT NAME: Ash Ponds Investigation
LOCATION: Council Bluffs, IA
DRILLING CO: Aquadrill
DRILLING METHOD: Hollow Stem Auger
FIELD PARTY: Auld, Dennis
GEOLOGIST: Eisen, Kevin
DATE BEGUN: 11/11/00 DATE COMPLETED: 11/12/00

FIELD BOOK NO: MEC - CB book 1
TOTAL DEPTH: 31'
GROUND SURFACE ELEVATION: 981.2'

STATIC WATER LEVEL (BGS)		
Depth (ft)		
Time		
Date		

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION
985.0							
984.0							
983.0							
982.0							
981.0							FILL: Coal fines, cinders and surface debris.
980.0			D/M				
979.0					-/75/25		
978.0					-/90/10		SILTY SAND: Orange/brown silty fine sand with coal fines.
977.0			D		-/95/5		SAND WITH SILT: Tan very fine to fine sand with silt.
976.0							
975.0							
974.0					-/95/5		
973.0			M				
972.0					-/80/20		SILTY SAND: Tan silty sand. Intermittant siltier lenses.
971.0							SAND WITH SILT: Tan very fine to fine sand with silt.
970.0							
969.0							
968.0			M		-/95/5		
967.0							

LITHOLOGY / WELL INSTALLATION



BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER	MW-6A

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION	LITHOLOGY	WELL CONSTRUCTION
967.0									
966.0			S				CLAY AND SILT: Gray silty clay.		
965.0					-/-/100		4" wood debris within silt/clay at 15' bgs.		
964.0							4" of 5% very fine sand at 16' bgs.		
							Alternating stiff and medium, 6" increments.		
963.0									
962.0									
961.0			S						
960.0									
959.0							Wood debris at 22' bgs.		
958.0							SILTY SAND: Varying units of silty sand and sand with silt.		
					-/20/80		3" of sandy silt at 23'.		
957.0					-/90/10		Water table at 24' bgs.		
956.0			S		-/70/30		Tan fine sand with silt.		
955.0					-/90/10				
954.0									
					-/80/20				
953.0							Tan very fine to fine silty sand.		
952.0					-/70/30		End of Pilot Boring at 55' bgs. MW-6A is screened 21-31' bgs. MW-6A is 5' Southwest of MW-6B. Protective risers and expandable well caps installed on both.		
951.0			S						

BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER	MW-6B

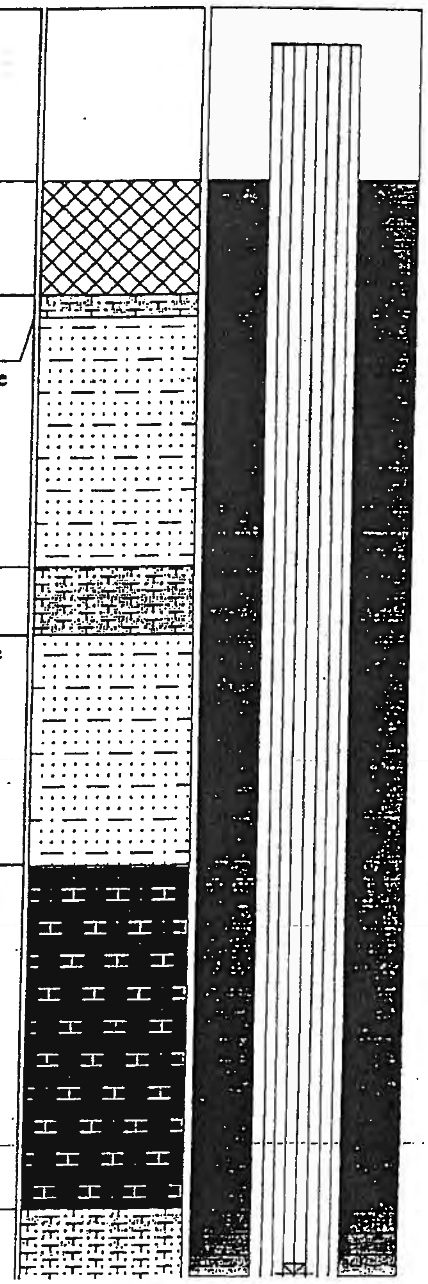
PROJECT NUMBER: MEC - Council Bluffs
PROJECT NAME: Ash Ponds Investigation
LOCATION: Council Bluffs, IA
DRILLING CO: Aquadrill
DRILLING METHOD: Hollow Stem Auger
FIELD PARTY: Auld, Dennis
GEOLOGIST: Eisen, Kevin
DATE BEGUN: 11/11/00 DATE COMPLETED: 11/11/00

FIELD BOOK NO: MEC - CB book 1
TOTAL DEPTH: 55'
GROUND SURFACE ELEVATION: 981.2'

STATIC WATER LEVEL (BGS)		
Depth (ft)		
Time		
Date		

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION
985.0							
984.0							
983.0							
982.0							
981.0							FILL: Coal fines, cinders and surface debris.
980.0			D/M				
979.0					-/75/25 -/90/10		
978.0							SILTY SAND: Orange/brown silty fine sand with coal fines.
977.0			D		-/95/5		SAND WITH SILT: Tan very fine to fine sand with silt.
976.0							
975.0							
974.0					-/95/5		
973.0			M				
972.0					-/80/20		SILTY SAND: Tan silty sand. Intermittant siltier lenses.
971.0							SAND WITH SILT: Tan very fine to fine sand with silt.
970.0							
969.0							
968.0			M		-/95/5		
967.0							
966.0			S				CLAY AND SILT: Gray silty clay.
965.0					-/-/100		4" wood debris within silt/clay at 15' bgs.
964.0							4" of 5% very fine sand at 16' bgs.
963.0							Alternating stiff and medium, 6" increments.
962.0							
961.0			S				
960.0							MW-6A is screened 21-31' bgs.
959.0							Wood debris at 22' bgs.
958.0					-/20/80		SILTY SAND: Varying units of silty sand and sand with silt. 3" of sandy silt at 23'.
957.0							

LITHOLOGY / WELL INSTALLATION

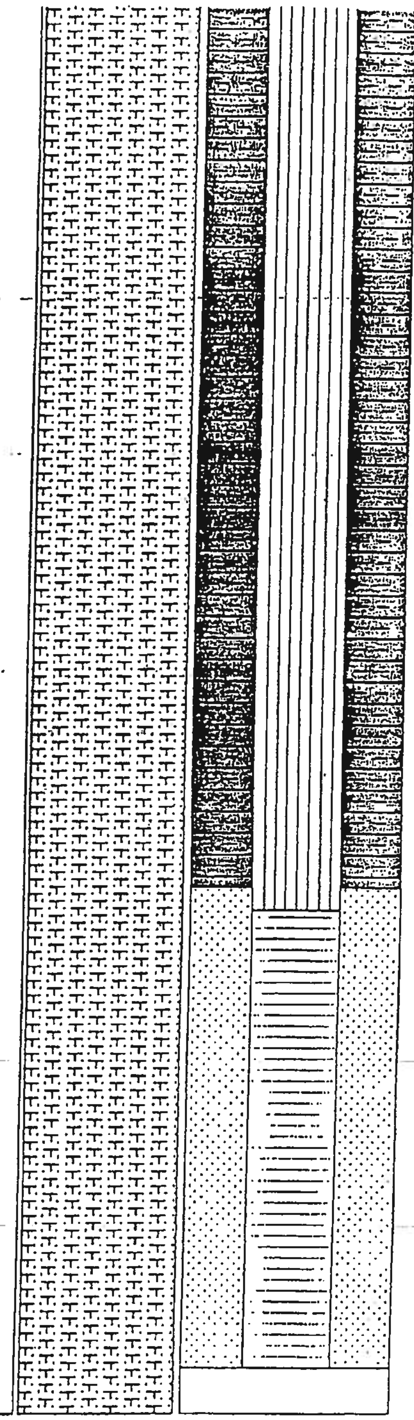


BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER	MW-6B

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION
957.0					-/90/10		Water table at 24' bgs.
956.0			S		-/70/30		Tan fine sand with silt.
955.0					-/90/10		
954.0							
953.0					-/80/20		Tan very fine to fine silty sand.
952.0					-/70/30		
951.0			S				
950.0					-/80/20		
949.0					-/30/70		Tan silt lens, 1" thick.
948.0							
947.0							
946.0			S				
945.0							
944.0					-/80/20		Tan/gray silty fine sand.
943.0							
942.0							
941.0			S				
940.0							Gray silty fine sand.
939.0					-/80/20		
938.0							1/2" silt lens at 44' bgs.
937.0							
936.0							
935.0							Gray unarmored clay balls, 1" diameter at: 43', 46', 47', and 48' bgs.
934.0					-/80/20		
933.0							
932.0							Gray silty very fine to fine sand, increased silt.
931.0							
930.0					-/70/30		
929.0							End of Pilot Boring at 55' bgs. MW-6B is screened 44-54' bgs. MW-6B is 5' Northeast of MW-6A. Protective risers and expandable well caps installed on both.
928.0							
927.0							

LITHOLOGY | WELL CONSTRUCTION



BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER	MW-7

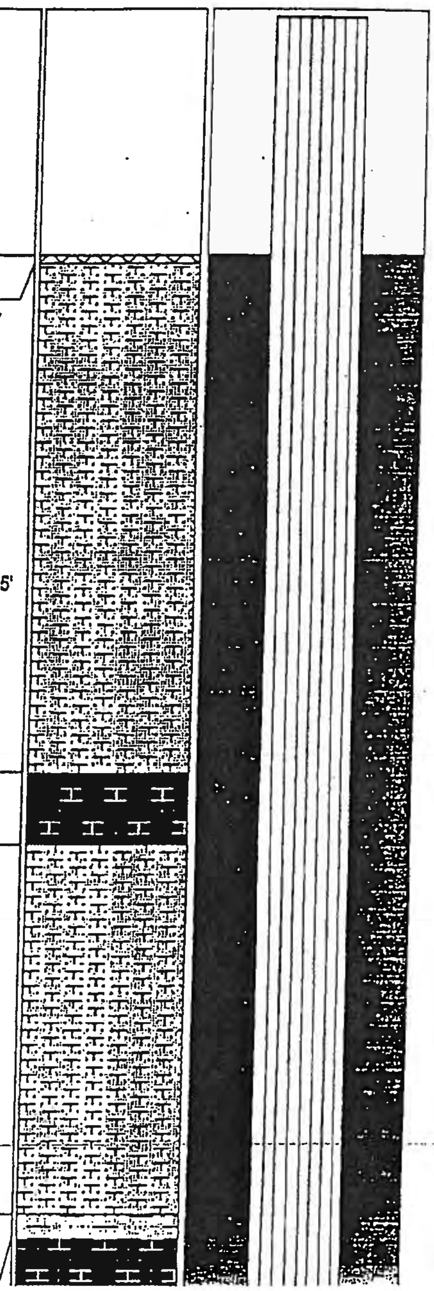
PROJECT NUMBER:	MEC - Council Bluffs	FIELD BOOK NO:	MEC - CB book 1
PROJECT NAME:	Ash Ponds Investigation	TOTAL DEPTH:	27'
LOCATION:	Council Bluffs, IA	GROUND SURFACE ELEVATION:	977.9
DRILLING CO:	Aquadrill		
DRILLING METHOD:	Hollow Stem Auger		
FIELD PARTY:	Auld, Dennis		
GEOLOGIST:	Eisen, Kevin		
DATE BEGUN:	11/12/00	DATE COMPLETED:	11/12/00

STATIC WATER LEVEL (BGS)		
Depth (ft)		
Time		
Date		

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION
981.0							
980.0							
979.0							
978.0							FILL: Coal fines and cinders.
977.0							SILTY SAND: Tan to tan/gray silty very fine to fine sand.
976.0					-/85/15		
975.0							
974.0					-/65/35		Gray clay balls, 1/2" diameter at 1.5' and 4.5' bgs.
973.0					-/80/20		
972.0							
971.0			M				CLAY AND SILT: Gray silt/clay. Low plasticity.
970.0							SILTY SAND: Tan/gray silty fine sand.
969.0							
968.0					-/80/20		
7.0							
966.0					-/30/70		SANDY SILT: Gray/black sandy silt with organic debris.
965.0							

LITHOLOGY

WELL INSTALLATION



BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER: MW-7

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION	LITHOLOGY	WELL CONSTRUCTION
965.0			D		-/3/97		CLAY AND SILT: Tan stiff silt/clay. Horizontally stratified.		
964.0							SAND: Tan fine sand with minor silt.		
963.0			D		-/95/5				
962.0									
961.0							SILTY SAND: Tan silty fine sand.		
960.0									
959.0					-/70/30		Water table at 19' bgs.		
958.0			S				Becoming gray.		
957.0					-/75/25				
956.0					-/70/30				
955.0					-/65/35				
954.0							End of Boring at 27' bgs. MW-7 is screened 16-26' bgs. Protective riser and expandable well cap installed.		
953.0			S						
952.0					-/80/20				
951.0					-/60/40		SILTY SAND: Silty sand and peat. 50/50 mix by volume.		
950.0									

BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER	MW-8A

PROJECT NUMBER: MEC - Council Bluffs
PROJECT NAME: Ash Ponds Investigation
LOCATION: Council Bluffs, IA
DRILLING CO: Aquadrill
DRILLING METHOD: Hollow Stem Auger
FIELD PARTY: Auld, Dennis
GEOLOGIST: Eisen, Kevin
DATE BEGUN: 11/14/00 DATE COMPLETED: 11/14/00

FIELD BOOK NO: MEC - CB book 1
TOTAL DEPTH: 27'
GROUND SURFACE ELEVATION: 981.4'

STATIC WATER LEVEL (BGS)		
Depth (ft)		
Time		
Date		

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION	LITHOLOGY	WELL INSTALLATION
984.0									
983.0									
982.0									
981.0							FILL: Coal dust and debris.		
							FILL: Limestone, massive.		
980.0					-/80/20		FILL: Mixture of silty sand, sandy silt, and silt/clay. Approximately 6" units.		
979.0			D		-/30/70				
					-/80/20		Silty fine sand w/ clay balls at 1.2' bgs.		
978.0					-/-/100		Gray sandy silt at 2.2' bgs.		
							Tan silty fine sand at 2.6' bgs.		
977.0					-/90/10		Gray clay/silt at 3.2' and 4.5' bgs.		
					-/-/100		Tan fine sand with silt at 4.1' bgs.		
976.0							FILL: Gray gritty fill, with silt-gravel sized grains. Bottom ash likely.		
975.0									
974.0									
973.0			D/M						
972.0									
971.0									
970.0									
969.0									

BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER	MW-8A

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION	LITHOLOGY	WELL CONSTRUCTION
968.0							CLAY AND SILT: Gray silt/clay.		
967.0									
966.0			M				With 7" of wood chips, 10% of volume.		
965.0					-/15/85		Gray silt with sand.		
964.0							With 18" wood chips, 10% volume.		
963.0							Stiff.		
							Small organic debris present. Backwater?		
962.0							Medium stiffness.		
961.0			M						
960.0									
959.0					-/-/100				
958.0							Medium stiffness. Moderate plasticity.		
957.0			M				End of Boring at 40' bgs. MW-8A is screened 17-27' bgs. MW-8A is 6' South of MW-8B. Protective risers and expandable well caps installed on both.		
956.0									
955.0					-/-/100				
			S				Gray silt, saturated.		

BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER	MW-8B

PROJECT NUMBER: MEC - Council Bluffs
PROJECT NAME: Ash Ponds Investigation
LOCATION: Council Bluffs, IA
DRILLING CO: Aquadrill
DRILLING METHOD: Hollow Stem Auger
FIELD PARTY: Auld, Dennis
GEOLOGIST: Eisen, Kevin
DATE BEGUN: 11/12/00 DATE COMPLETED: 11/14/00

FIELD BOOK NO: MEC - CB book 1
TOTAL DEPTH: 40'
GROUND SURFACE ELEVATION: 981.5'

STATIC WATER LEVEL (BGS)		
Depth (ft)		
Time		
Date		

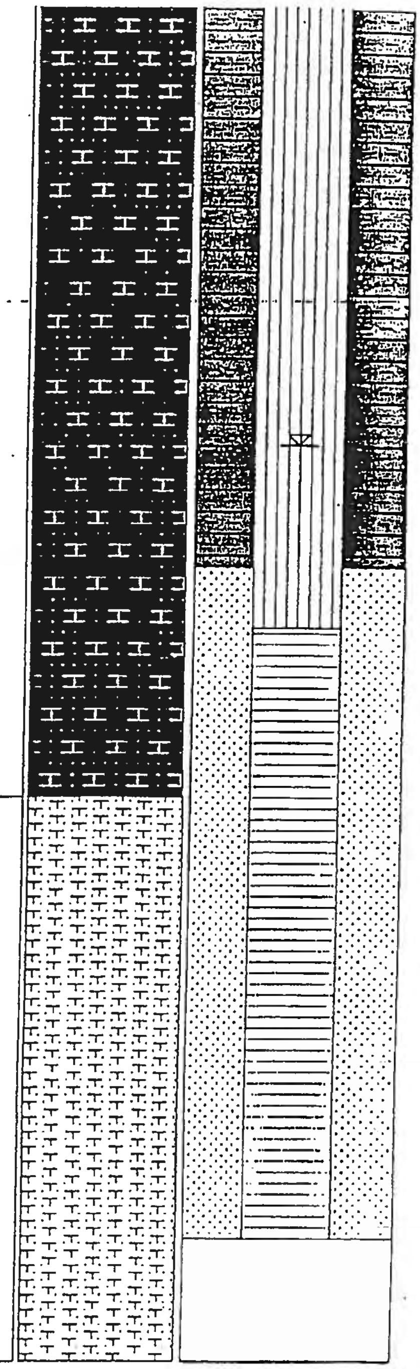
ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION	LITHOLOGY	WELL INSTALLATION
984.0									
983.0									
982.0									
981.0							FILL: Coal dust and debris.		
							FILL: Limestone, massive.		
980.0					-/80/20		FILL: Mixture of silty sand, sandy silt, and silt/clay. Approximately 6" units.		
979.0			D		-/30/70		Silty fine sand w/ clay balls at 1.2' bgs.		
					-/80/20		Gray sandy silt at 2.2' bgs.		
978.0					-/-/100		Tan silty fine sand at 2.6' bgs.		
977.0					-/90/10		Gray clay/silt at 3.2' and 4.5' bgs.		
					-/-/100		Tan fine sand with silt at 4.1' bgs.		
976.0							FILL: Gray gritty fill, with silt-gravel sized grains. Bottom ash likely.		
975.0									
974.0									
973.0			D/M						
972.0									
971.0									
970.0									
969.0									
968.0							CLAY AND SILT: Gray silt/clay.		
967.0									
966.0			M				With 7" of wood chips, 10% of volume.		
965.0					-/15/85		Gray silt with sand.		
964.0							With 18" wood chips, 10% volume.		

BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER: MW-8B

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION
963.0							As above. Gray silt/clay. Stiff. Small organic debris present. Backwater?
962.0							Medium stiffness.
961.0			M				
960.0							
959.0					-/-/100		
958.0							Medium stiffness. Moderate plasticity.
957.0			M				
956.0							
955.0			S		-/-/100		Gray silt, saturated.
954.0							
953.0							
952.0							
951.0							
950.0					-/60/40		SILTY SAND: Tan/gray silty sand. Decreasing silt content with depth.
949.0			S		-/70/30		
948.0							
947.0					-/75/25		
946.0							
945.0							
944.0			S		-/80/20		
943.0							End of Boring at 40' bgs. MW-8B is screened 28-38' bgs. MW-8B is 6' North of MW-8A. Protective risers and expandable well caps installed on both.
942.0					-/85/15		

LITHOLOGY / WELL CONSTRUCTION



BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER	MW-9

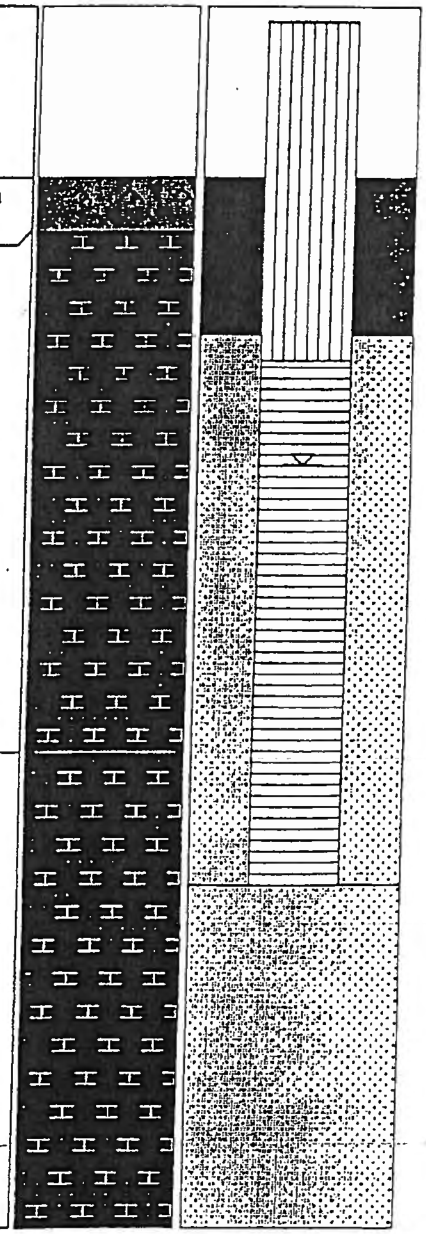
PROJECT NUMBER: MEC - Council Bluffs
PROJECT NAME: Ash Ponds Investigation
LOCATION: Council Bluffs, IA
DRILLING CO: Aquadrill
DRILLING METHOD: Hollow Stem Auger
FIELD PARTY: Auld, Dennis
GEOLOGIST: Eisen, Kevin
DATE BEGUN: 11/10/00 DATE COMPLETED: 11/10/00

FIELD BOOK NO: MEC - CB book 1
TOTAL DEPTH: 20'
GROUND SURFACE ELEVATION: 968.7'

STATIC WATER LEVEL (BGS)		
Depth (ft)		
Time		
Date		

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION
972.0							
971.0							
970.0							
969.0							
968.0			M				TOPSOIL: Brown/gray silt and clay with organics.
967.0							CLAY AND SILT: Gray clay/silt.
966.0			M		-/-/100		
965.0							Minor organics in top 2' of unit (to 3' bgs).
964.0							
963.0							Water table (stablized) at 5.5' bgs.
962.0					-/-/100		Low plasticity.
961.0							
960.0					-/5/95		5% very fine sand in matrix.
959.0					-/-/100		
958.0			S		-/70/30		1/2" thick silty sand seam at 11' bgs.
957.0					-/-/100		CLAY AND SILT: Tan/gray silt/clay.
956.0							
955.0							
954.0							
953.0					-/-/100		
952.0			S		-/70/30		1/4" thick silty sand seam at 16.5' bgs.
951.0							
950.0					-/-/100		End of Boring at 20' bgs. Screened interval 3.5 - 13.5' bgs. Protective riser and expandable well cap installed.
949.0							

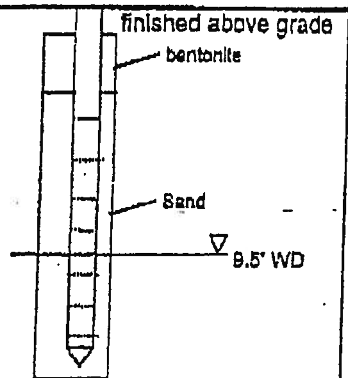
LITHOLOGY / WELL INSTALLATION



SOIL BORING LOG AND MONITORING WELL CONSTRUCTION DIAGRAM

Boring/Well Number: ~~MW1~~ (MW10) LOCATED WEST SIDE OF North Pond	Facility Name: MidAmerican Energy Ash Pond		Facility Street Address: 2115 Navajo road Council Bluffs, Iowa
Boring Depth (ft) x Diameter (in): 13.5' x 7.25"		Drilling Method: HS Auger	
Well Contractor Name: D. Scott Kratz		Logged by: Kris LeVier	
Registration Number: 40176			
Ground Surface Elevation (ASL): N/A		Top of Casing Elevation (ASL): N/A	
Date: 11/27/00 Start Time: 11:30	Date: 11/27/00 End Time: 12:15	UST Number: N/A	LUST Number: N/A

Depth (feet)	Well Construction Details	Blow Count (if applic.)	Sample No.	Sample Type*	PID/FID Reading	Rock Formations, Soil, Color and Classifications, Observations (moisture, odor, etc.) First column for USCS.	
0	finished above grade; bentonite						
3						CL	brown, silty clay, soft, moist
5						ML	brown, clayey silt, moist
7.5	Sand						
10	9.5' WD						saturated
12.5							
15	Bottom of well 13.5'						Bottom of boring 14'



*SS (split spoon) HS (hollow stem auger) ▽ = water level while drilling ▼ = Static Water Level

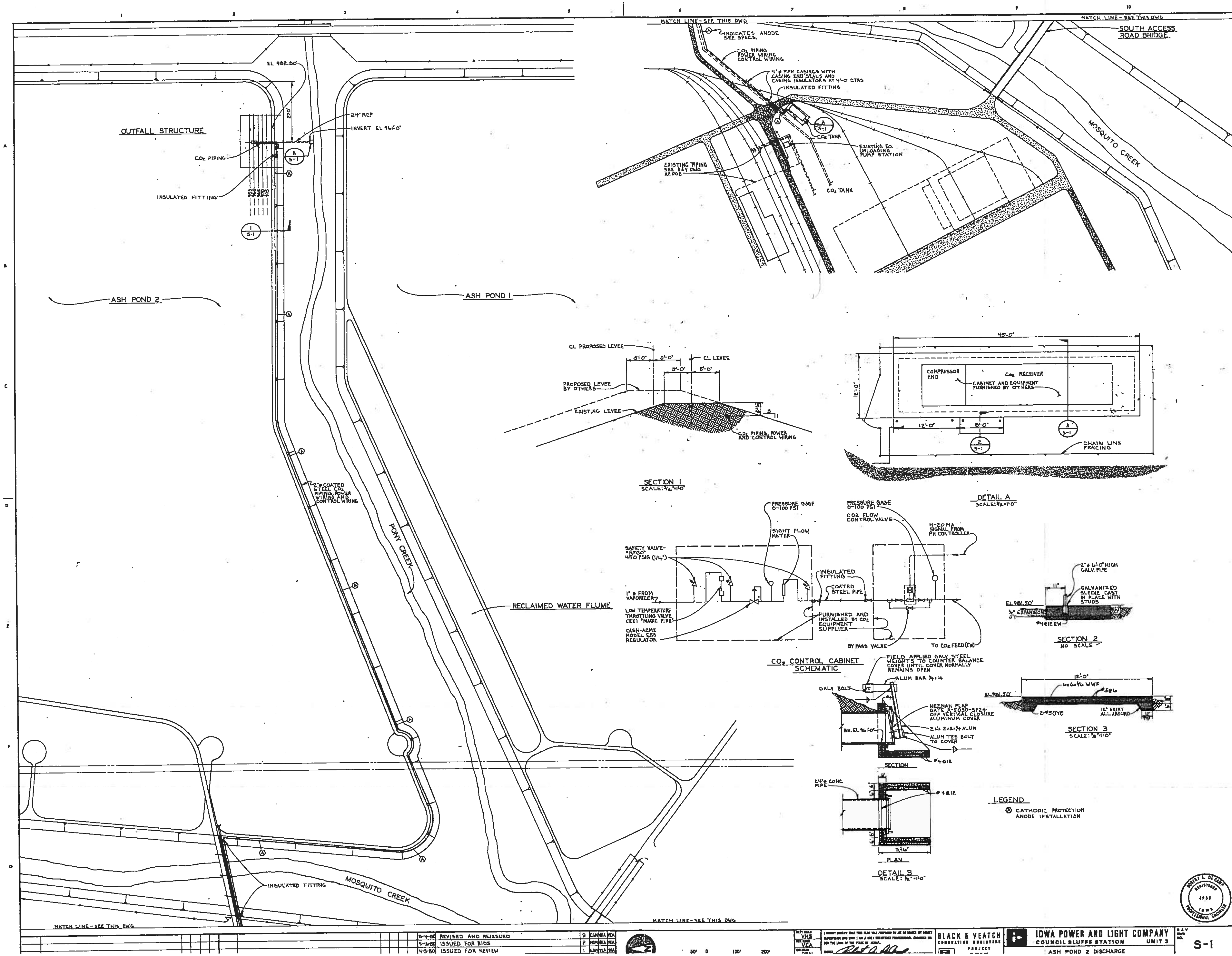
Observations	Date:	11/27/00	12/21/00		
Water Levels (ASL)	Level:	9.5' WD	7.45' below ground surface		
Static Water Level Symbol (V)	Time:	12:00	1:45		

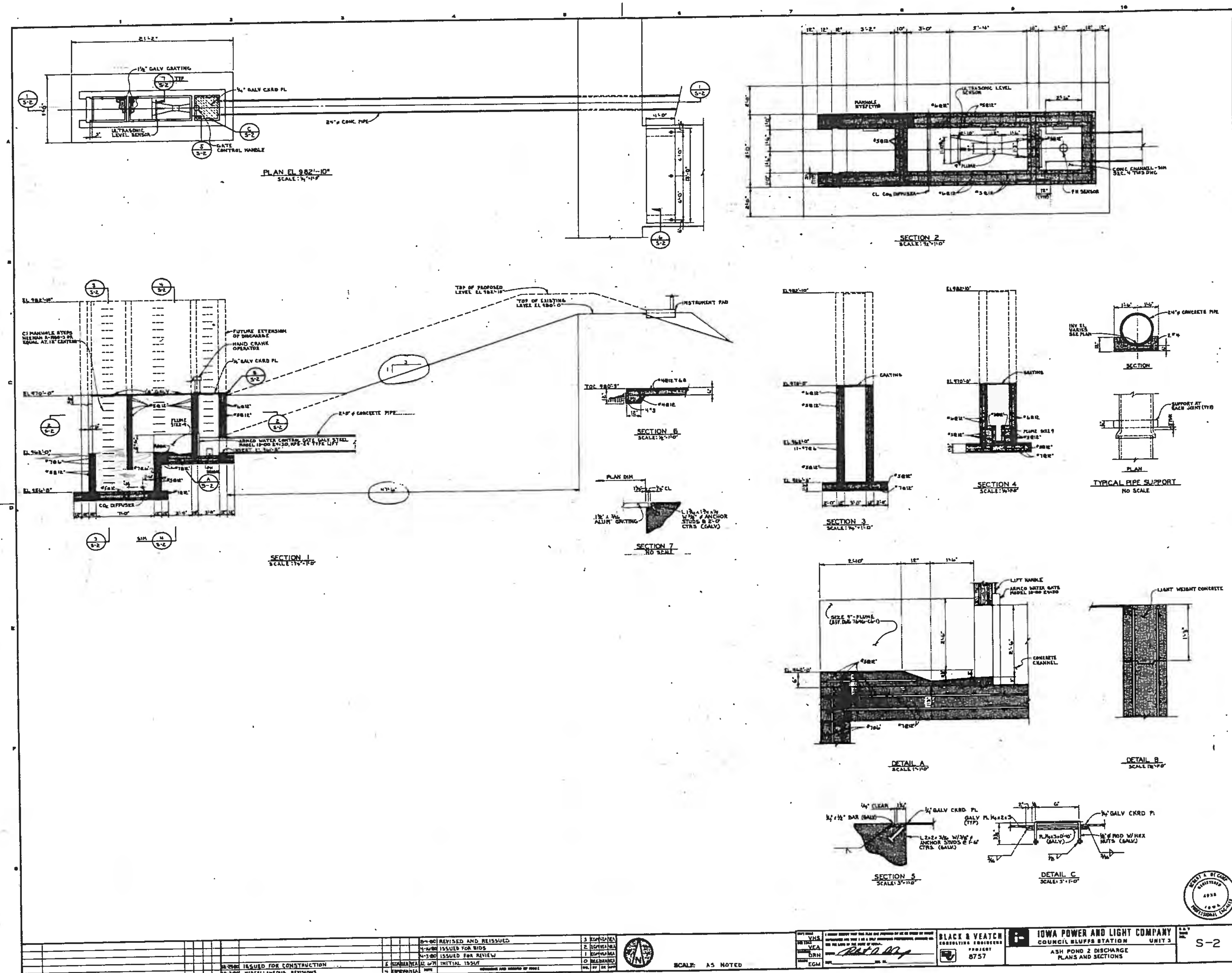
DNR FORM 542-1392

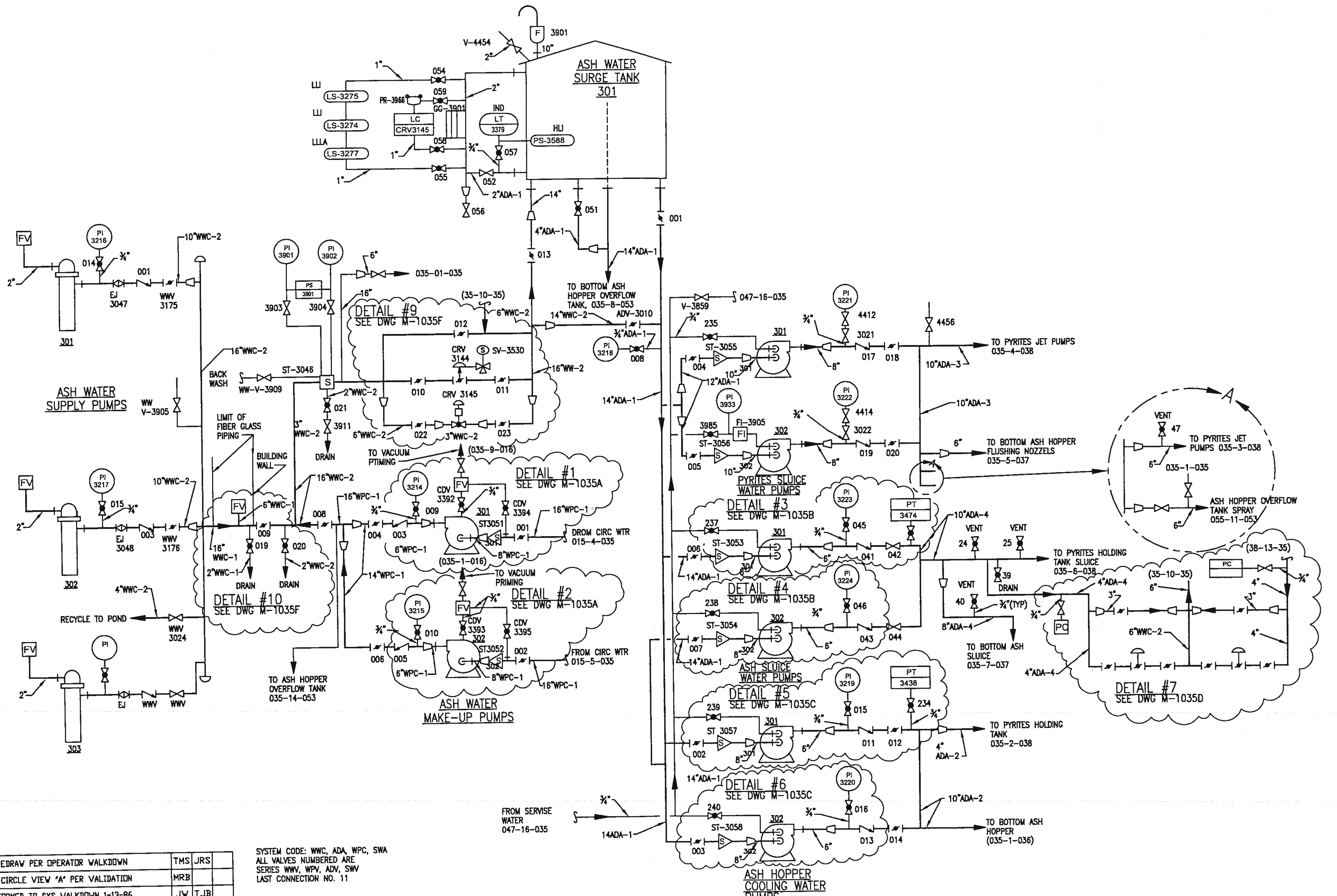
NOTE: THIS WELL HAS BEEN REDESIGNATED MW10 to AVOID CONFUSION WITH PREEXISTING MW1 LOCATED EAST OF THE NORTH POND

APPENDIX C

DOC 1.5 ASH POND 2 DISCHARGE PLANS AND SECTIONS


MATCH LINE - SEE THIS DWG
SOUTH ACCESS ROAD BRIDGE
MOSQUITO CREEK
INDICATES ANODE SEE SPECS.
CO2 PIPING POWER WIRING CONTROL WIRING
4" ø PIPE CASINGS WITH CASING END SEALS AND CASING INSULATORS AT 4'-0" CTRS
INSULATED FITTING
CO2 TANK
EXISTING SO. UNLOADING PUMP STATION
EXISTING PIPING SEE B&V DWG AE002
EL 982.80'
24" RCP
INVERT EL 961'-0"
OUTFALL STRUCTURE
CO2 PIPING
INSULATED FITTING
ASH POND 2
ASH POND 1
CL PROPOSED LEVEE
CL LEVEE
PROPOSED LEVEE BY OTHERS
EXISTING LEVEE
CO2 PIPING, POWER AND CONTROL WIRING
SECTION 1
SCALE: 3/16"=1'-0"
45'-0"
12'-0"
COMPRESSOR END
CO2 RECEIVER
CABINET AND EQUIPMENT FURNISHED BY OTHERS
CHAIN LINK FENCING
DETAIL A
SCALE: 3/16"=1'-0"
2" ø COATED STEEL CO2 PIPING, POWER WIRING AND CONTROL WIRING
PONY CREEK
RECLAIMED WATER FLUME
PRESSURE GAGE 0-100 PSI
SIGHT FLOW METER
SAFETY VALVE - "REGO" 450 PSIG (1/4")
1" ø FROM VAPORIZER
LOW TEMPERATURE THROTTLING VALVE CEXI "MAGIC PIPE"
CASH-ACME MODEL ESS REGULATOR
INSULATED FITTING
COATED STEEL PIPE
FURNISHED AND INSTALLED BY CO2 EQUIPMENT SUPPLIER
PRESSURE GAGE 0-100 PSI
CO2 FLOW CONTROL VALVE
4-20 MA SIGNAL FROM PH CONTROLLER
BY PASS VALVE
TO CO2 FEED (TYP)
CO2 CONTROL CABINET SCHEMATIC
2" ø 6'-0" HIGH GALV. PIPE
GALVANIZED SLEEVE CAST IN PLACE WITH STUDS
EL 981.50'
1/2" EXPANSION JT
#4@12 EW
SECTION 2
NO SCALE
FIELD APPLIED GALV STEEL WEIGHTS TO COUNTER BALANCE COVER UNTIL COVER NORMALLY REMAINS OPEN
ALUM BAR 3/8 x 4
GALV BOLT
NEENAH FLAP GATE R-5050-SF24 OFF VERTICAL CLOSURE ALUMINUM COVER
INV. EL 961'-0"
2 Ls 2x2x1/4 ALUM
ALUM TEE BOLT TO COVER
#4@12
SECTION
24" ø CONC. PIPE
#4@12
PLAN
DETAIL B
SCALE: 1/2"=1'-0"
12'-0"
6x6-W4 WWF
EL 981.50'
2-#5 (TYP)
12" SKIRT ALL AROUND
SECTION 3
SCALE: 3/8"=1'-0"
LEGEND
CATHODIC PROTECTION ANODE INSTALLATION
INSULATED FITTING
MOSQUITO CREEK
MATCH LINE - SEE THIS DWG
8-4-80 REVISED AND REISSUED
4-16-80 ISSUED FOR BIDS
4-3-80 ISSUED FOR REVIEW
BLACK & VEATCH CONSULTING ENGINEERS
IOWA POWER AND LIGHT COMPANY
COUNCIL BLUFFS STATION UNIT 3
ASH POND 2 DISCHARGE
S-1


PLAN EL 982'-10"
SECTION 1
SECTION 2
SECTION 3
SECTION 4
SECTION 5
SECTION 6
SECTION 7
DETAIL A
DETAIL B
DETAIL C
TYPICAL PIPE SUPPORT
NO SCALE
24"ø CONC. PIPE
ISSUED FOR CONSTRUCTION
MISCELLANEOUS REVISIONS
REVISED AND REISSUED
ISSUED FOR BIDS
ISSUED FOR REVIEW
INITIAL ISSUE
SCALE: AS NOTED
VHS
VFA
DRN
EGM
BLACK & VEATCH
CONSULTING ENGINEERS
PROJECT
8757
IOWA POWER AND LIGHT COMPANY
COUNCIL BLUFFS STATION UNIT 3
ASH POND 2 DISCHARGE
PLANS AND SECTIONS
S-2



SYSTEM CODE: WWC, ADA, WPC, SWA
ALL VALVES NUMBERED ARE
SERIES WWV, WPV, ADV, SWV
LAST CONNECTION NO. 11

12	10-9-02	UE REDRAW PER OPERATOR WALKDOWN	TMS	JRS
11	1-3-96	ADD CIRCLE VIEW 'A' PER VALIDATION	MRB	
10	2-22-88	CONFORMED TO SYS WALKDOWN 1-13-86	JW	TJB
9	2-25-85	ADD DETAIL 8 & 9 PER VALIDATION		
8	10-29-84	ADD DETAIL 7 PER VALIDATION		
7	10-23-84	ADD DETAILS 1,2,3,4,5,6 PER VALIDATION		
6	8-24-79	CONFORMED TO CONSTRUCTION RECORDS		DM
5	2-11-77	APPROVED FOR CONSTRUCTION	TAG	TAG DLM

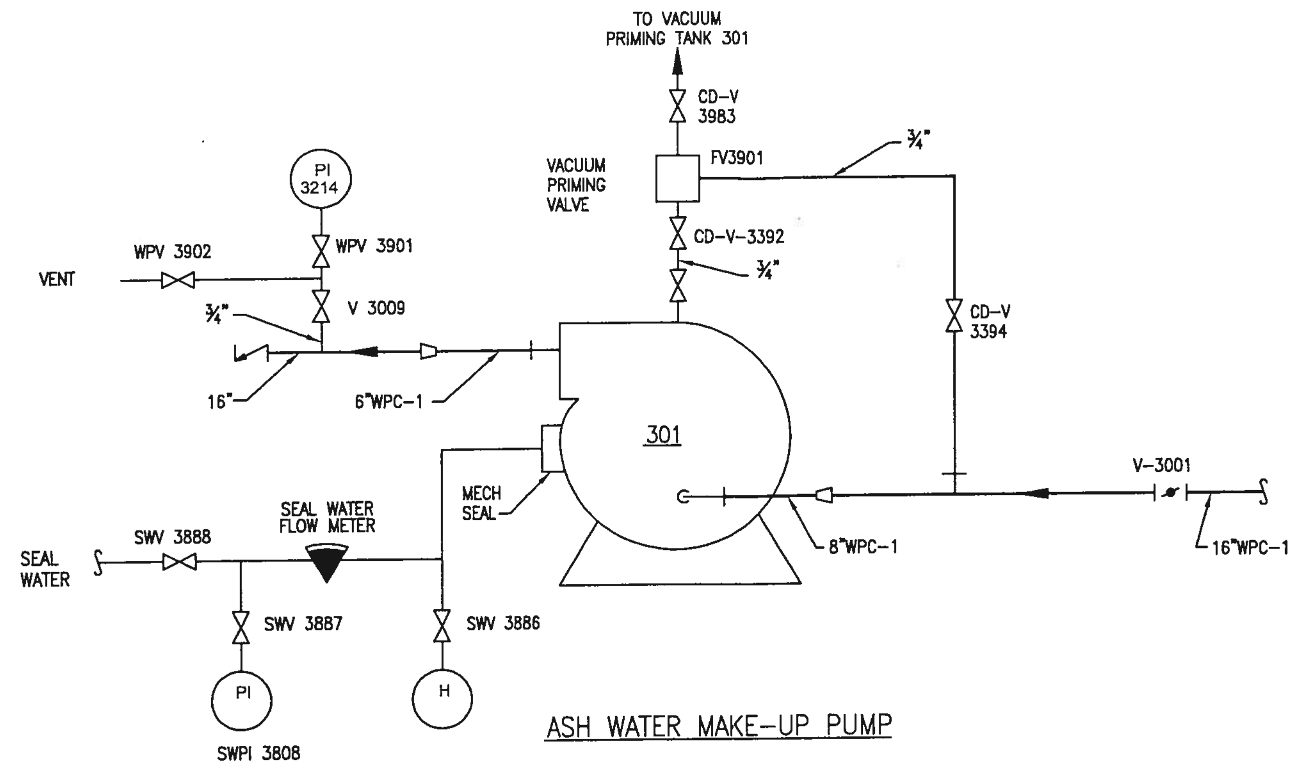
3	8-13-76	ISSUED FOR BID C4B & M14A	DLM
2	6-7-76	ISSUED FOR CONTRACT C4A	DM
1	4-26-76	ISSUED FOR ADDENDUM 1	DM

MidAmerican ENERGY

MIDAMERICAN ENERGY
COUNCIL BLUFFS ENERGY CENTER UNIT 3
PIPING AND INSTRUMENT DIAGRAM

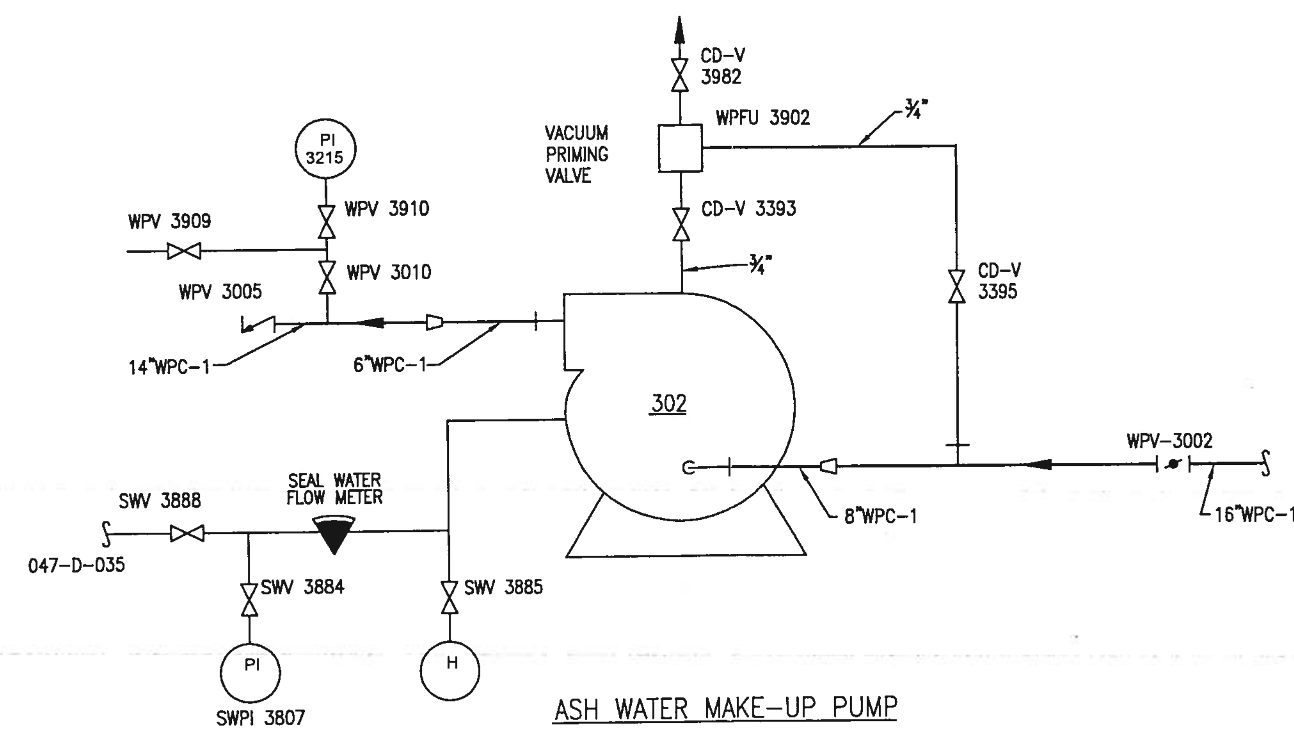
PROJECT	DRAWING NUMBER	REV
6247	M1035	12

ENGINEER DRAWN
SHEET 1 OF 1



ASH WATER MAKE-UP PUMP

DETAIL #1
SEE DWG. M1035



ASH WATER MAKE-UP PUMP

DETAIL #2
SEE DWG. M1035

7					3					MidAmerican ENERGY	MIDAMERICAN ENERGY COUNCIL BLUFFS ENERGY CENTER UNIT 3	PROJECT	DRAWING NUMBER M1035A	REV 1
6					2									
5					1	10-8-02	UE REDRAW PER OPERATOR WALKDOWN	TMS	SKK	ENGINEER DRAWN	PIPING AND INSTRUMENT DIAGRAM	SHEET 1 OF 1		

APPENDIX C

DOC 1.6 NPDES PERMIT

Fields of Opportunities

STATE OF IOWA

THOMAS J. VILSACK, GOVERNOR
SALLY J. PEDERSON, LT. GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
JEFFREY R. VONK, DIRECTOR

October 16, 2006

Brian Williams, Sr. Environmental Coordinator
MidAmerican Energy Company
4299 NW Urbandale Drive
Urbandale, Iowa 50322

Subject: NPDES Permit Amendment
NPDES Permit Number 78-20-1-01

Dear Mr. Williams,

Enclosed please find the final NPDES permit amendment for your wastewater discharge. The issued amendment contains identical conditions to those specified in the draft amendment mailed September 12, 2006.

Please contact me by telephone at 515/242-6148 or by e-mail at john.warren@dnr.state.ia.us if you have any questions concerning this amendment.

Sincerely,

J Warren

John Warren
NPDES Section

Enclosure: NPDES Permit Amendment

Cc. Field Office 4 (WW)
MidAmerican Energy Company, 7215 Navajo Street, Council Bluffs, Iowa 51501
EPA Region 7

STATE OF IOWA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROGRAM
AMENDMENT TO NPDES PERMIT

Iowa NPDES Permit #	7820101
Date of Issuance:	February 27, 2003
Date of Expiration:	February 26, 2008
Date of this Amendment:	**October 16, 2006**
EPA Number:	IA0004308

Name and Mailing Address of Applicant:

MidAmerican Energy Company
666 Grand Avenue
P.O. Box 657
Des Moines, Iowa 50303

Identity and Location of Facility:

MidAmerican Energy Company
Council Bluffs Energy Center
7215 Navajo Street
Council Bluffs, Iowa 51501
Township 74N, Range 44W, Section 25
Pottawattamie County, Iowa

Pursuant to the authority Iowa Code Section 455B.174, and of Rule 567--64.3, Iowa Administrative Code, the Director of the Iowa Department of Natural Resources has issued the above referenced permit. Pursuant to the same authority the Director hereby amends said permit as set forth below:

The permit is being amended to authorize a new discharge of cooling tower blowdown (outfall 008) from Unit 4, which will ultimately discharge through outfall 003. Effluent limits, monitoring requirements, and special conditions associated with this wastestream shall be added to assure compliance with federal effluent guidelines and state water quality standards.

A compliance schedule shall be added that requires the facility to comply with new effluent iron limits that will apply to outfall 801, the combined discharge from outfalls 001 and 003.

Please replace the current permit pages 2 through 7 with the enclosed pages 2 through 15.

For the Department of Natural Resources:

By [signature]
John Warren, Environmental Specialist
NPDES Section

ENVIRONMENTAL SERVICES DIVISION

Facility **e:** MIDAMERICAN ENERGY COMPANY-COUNCIL BLUFFS

Permit Number: 7820101

Outfall Number	**Outfall Description**
001	DISCHARGE CONSISTS OF CONDENSER AND CONDENSATE COOLER HEAT EXCHANGER COOLING WATER FROM TURBINE GENERATOR UNIT #1 & #2, ROOF DRAINS, AND STORM WATER RUNOFF.

Receiving Stream: MISSOURI RIVER

Route of flow:

003	DISCHARGE CONSISTS OF CONDENSER AUXILIARY COOLING WATER HEAT EXCHANGER COOLING WATER FOR TURBINE GENERATOR UNIT #3 AND COOLING TOWER BLOWDOWN FROM UNIT #4.

Receiving Stream: MISSOURI RIVER

Route of flow:

004	DISCHARGE CONSISTS OF STORM WATER RUNOFF, CITY WATER FOR FIRE PROTECTION, BUILDING WASHDOWN, WELL WATER FOR COAL PILE AND ROAD DUST SUPPRESION, AND PLANT DRAINS.

Receiving Stream: MISSOURI RIVER

Route of flow:

006	DISCHARGE CONSISTS OF ASH TRANSPORT WATER, BOILER BLOWDOWN, FLOOR DRAINS, STORM WATER RUNOFF FROM ASH RETENTION POND #2, CLARIFIED TREATED WATER, ASH HOPPER WATER, BEARING COOLING WATER, SEAL WATER, AND AIR CONDITIONING COOLING WATER.

Receiving Stream: MISSOURI RIVER

Route of flow:

008	DISCHARGE CONSISTS OF COOLING TOWER BLOWDOWN. THIS IS AN INTERNAL OUTFALL THAT DISCHARGES THROUGH OUTFALL 003.

Receiving Stream: MISSOURI RIVER

Route of flow: OUTFALL 003 TO MISSOURI RIVER

Facility Name: MIDAMERICAN ENERGY COMPANY-COUNCIL BLUFFS

Permit Number: 7820101

801 COMBINED DISCHARGE FROM OUTFALLS 001 AND 003.

Receiving Stream: MISSOURI RIVER

Route of flow:

The permit was written to protect warm water game fish populations along with a resident aquatic community that includes a variety of native nongame fish and invertebrate species. The permit also protects for recreational or other uses that may result in prolonged and direct contact with the water, involving considerable risks of ingesting water in quantities sufficient to pose a health hazard. Such activities would include, but not be limited to, swimming, diving, water skiing, and water contact recreational canoeing.

Facility N: MIDAMERICAN ENERGY COMPANY-COUNCIL BLUFFS

Permit Number: 7820101

Effluent Limitations

Outfall No.: 004 DISCHARGE CONSISTS OF STORM WATER RUNOFF, CITY WATER FOR FIRE PROTECTION, BUILDING WASHDOWN, WELL WATER FOR COAL PILE AND ROAD DUST SUPPRESION AND PLANT DRAINS.

Interim Limits Start: 02/27/2003 Interim Limits End: 11/01/2007

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

				EFFLUENT LIMITATIONS							
				Concentration				Mass			
Wastewater Parameter	Season	Type of Limit	% Removal	7 Day Average/Min	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
TOTAL SUSPENDED SOLIDS	YEARLY	INTER				50.0	MG/L				
TOTAL SUSPENDED SOLIDS	YEARLY	FINAL				50.0	MG/L				
PH (MINIMUM - MAXIMUM)	YEARLY	INTER		6.0		9.0	STD UNITS				
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL		6.0		9.0	STD UNITS				

Note: If seasonal limits apply, summer is from March 15 through November 15, and winter is from November 16 through March 14.

Facility Name: MIDAMERICAN ENERGY COMPANY-COUNCIL BLUFFS

Permit Number: 7820101

Non-Standard Effluent Limitations

OUTFALL NO.: 004 DISCHARGE CONSISTS OF STORM WATER RUNOFF, CITY WATER FOR FIRE PROTECTION, BUILDING WASHDOWN, WELL WATER FOR COAL PILE AND ROAD DUST SUPPRESION AND PLANT DRAINS.

Wastewater Parameter	Non-Standard Limits
TOTAL SUSPENDED SOLIDS	ANY UNTREATED OVERFLOW FROM FACILITIES DESIGNED, CONSTRUCTED, AND OPERATED TO TREAT THE VOLUME OF COAL PILE RUNOFF WHICH IS ASSOCIATED WITH A 10 YEAR, 24 HOUR RAINFALL EVENT SHALL NOT BE SUBJECT TO THE LIMITATIONS REQUIRED FOR STORM WATER RUNOFF FROM THE COAL STORAGE AREA.

Facility Na MIDAMERICAN ENERGY COMPANY-COUNCIL BLUFFS

Permit Number: 7820101

Effluent Limitations

Outfall No.: 006 DISCHARGE CONSISTS OF ASH TRANSPORT WATER, BOILER BLOWDOWN, FLOOR DRAINS, STORM WATER RUNOFF FROM ASH RETENTION POND #2, CLARIFIED TREATED WATER, ASH HOPPER WATER, BEARING COOLING WATER, SEAL WATER, AND AIR CONDITIONING COOLING WATER.

Interim Limits Start: 02/27/2003 Interim Limits End: 11/01/2007

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

				EFFLUENT LIMITATIONS							
				Concentration				Mass			
Wastewater Parameter	Season	Type of Limit	% Removal	7 Day Average/Min	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
TOTAL SUSPENDED SOLIDS	YEARLY	INTER			30.0	100.0	MG/L		755.0	2,518.0	LBS/DAY
TOTAL SUSPENDED SOLIDS	YEARLY	FINAL			30.0	100.0	MG/L		755.0	2,518.0	LBS/DAY
PH (MINIMUM - MAXIMUM)	YEARLY	INTER		6.0		9.0	STD UNITS				
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL		6.0		9.0	STD UNITS				
OIL AND GREASE	YEARLY	INTER			15.0	20.0	MG/L		379.0	504.0	LBS/DAY
OIL AND GREASE	YEARLY	FINAL			15.0	20.0	MG/L		379.0	504.0	LBS/DAY
ACUTE TOXICITY, CERIODAPHNIA	YEARLY	INTER							1.0		NO TOXICITY
ACUTE TOXICITY, CERIODAPHNIA	YEARLY	FINAL							1.0		NO TOXICITY
ACUTE TOXICITY, PIMEPHALES	YEARLY	INTER							1.0		NO TOXICITY
ACUTE TOXICITY, PIMEPHALES	YEARLY	FINAL							1.0		NO TOXICITY

Note: If seasonal limits apply, summer is from March 15 through November 15, and winter is from November 16 through March 14.

Facility Name: MIDAMERICAN ENERGY COMPANY-COUNCIL BLUFFS

Permit Number: 7820101

Effluent Limitations

Outfall No.: 008 DISCHARGE CONSISTS OF COOLING TOWER BLOWDOWN. THIS IS AN INTERNAL OUTFALL THAT DISCHARGES THROUGH OUTFALL 003.

Interim Limits Start: 02/27/2003 Interim Limits End: 11/01/2007

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

				EFFLUENT LIMITATIONS							
				Concentration				Mass			
Wastewater Parameter	Season	Type of Limit	% Removal	7 Day Average/Min	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
PH (MINIMUM - MAXIMUM)	YEARLY	INTER		6.0		9.0	STD UNITS				
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL		6.0		9.0	STD UNITS				
CHLORINE,FREE AVAILABLE	YEARLY	INTER			0.2	0.5	MG/L		3.9	9.6	LBS/DAY
CHLORINE,FREE AVAILABLE	YEARLY	FINAL			0.2	0.5	MG/L		3.9	9.6	LBS/DAY
CHROMIUM,TOTAL (AS CR)	YEARLY	INTER			0.2	0.2	MG/L		3.9	3.9	LBS/DAY
CHROMIUM,TOTAL (AS CR)	YEARLY	FINAL			0.2	0.2	MG/L		3.9	3.9	LBS/DAY
ZINC,TOTAL (AS ZN)	YEARLY	INTER			1.0	1.0	MG/L		19.3	19.3	LBS/DAY
ZINC,TOTAL (AS ZN)	YEARLY	FINAL			1.0	1.0	MG/L		19.3	19.3	LBS/DAY
DURATION OF CHLORINE DISCHARGE	YEARLY	INTER				2.0	HOURS/DAY				
DURATION OF CHLORINE DISCHARGE	YEARLY	FINAL				2.0	HOURS/DAY				

Note: If seasonal limits apply, summer is from March 15 through November 15, and winter is from November 16 through March 14.

Facility Na MIDAMERICAN ENERGY COMPANY-COUNCIL BLUFFS

Permit Number: 7820101

Effluent Limitations

Outfall No.: 801 COMBINED DISCHARGE FROM OUTFALLS 001 AND 003.

Interim Limits Start: 02/27/2003 Interim Limits End: 11/01/2007

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

Wastewater Parameter	Season	Type of Limit	% Removal	EFFLUENT LIMITATIONS							
				Concentration				Mass			
				7 Day Average/Min	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
IRON, TOTAL (AS FE)	YEARLY	FINAL			1.04	1.04	MG/L		4,797.0	4,797.0	LBS/DAY

Note: If seasonal limits apply, summer is from March 15 through November 15, and winter is from November 16 through March 14.

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods specified in 40 CFR Part 136 or other methods approved in writing by the department shall be utilized.

(c) Chapter 63 of the Iowa Administrative Code provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by, or approved by, the department, and shall be submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each reporting period.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
001	FLOW	7/WEEK OR DAILY	24 HOUR TOTAL	FINAL EFFLUENT
001	TEMPERATURE	7/WEEK OR DAILY	GRAB	FINAL EFFLUENT
001	VISUAL OBSERVATION	QUARTERLY	VISUAL	FINAL EFFLUENT DURING A QUALIFYING STORM EVENT
003	FLOW	7/WEEK OR DAILY	24 HOUR TOTAL	FINAL EFFLUENT
003	TEMPERATURE	7/WEEK OR DAILY	GRAB	FINAL EFFLUENT
004	TOTAL SUSPENDED SOLIDS	1 EVERY MONTH	GRAB	FINAL EFFLUENT DURING PERIOD OF DISCHARGE
004	PH (MINIMUM - MAXIMUM)	1 EVERY MONTH	GRAB	FINAL EFFLUENT DURING PERIOD OF DISCHARGE
004	VISUAL OBSERVATION	QUARTERLY	VISUAL	FINAL EFFLUENT DURING A QUALIFYING STORM EVENT
006	FLOW	1 TIME PER WEEK	INSTANTANEOUS	FINAL EFFLUENT DURING PERIOD OF DISCHARGE
006	TOTAL SUSPENDED SOLIDS	1 TIME PER WEEK	GRAB	FINAL EFFLUENT DURING PERIOD OF DISCHARGE
006	PH (MINIMUM - MAXIMUM)	1 TIME PER WEEK	GRAB	FINAL EFFLUENT DURING PERIOD OF DISCHARGE
006	OIL AND GREASE	1 TIME PER WEEK	GRAB	FINAL EFFLUENT DURING PERIOD OF DISCHARGE
006	TEMPERATURE	1 EVERY MONTH	GRAB	FINAL EFFLUENT DURING PERIOD OF DISCHARGE
006	ACUTE TOXICITY, CERIODAPHNIA	1 EVERY 12 MONTHS	GRAB	FINAL EFFLUENT DURING PERIOD OF DISCHARGE
006	ACUTE TOXICITY, PIMEPHALES	1 EVERY 12 MONTHS	GRAB	FINAL EFFLUENT DURING PERIOD OF DISCHARGE

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods specified in 40 CFR Part 136 or other methods approved in writing by the department shall be utilized.

(c) Chapter 63 of the Iowa Administrative Code provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by, or approved by, the department, and shall be submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each reporting period.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
006	VISUAL OBSERVATION	QUARTERLY	VISUAL	FINAL EFFLUENT DURING A QUALIFYING STORM EVENT
008	FLOW	7/WEEK OR DAILY	24 HOUR TOTAL	FINAL EFFLUENT PRIOR TO MIXING WITH OTHER WASTESTREAMS
008	PH (MINIMUM - MAXIMUM)	1 TIME PER WEEK	GRAB	FINAL EFFLUENT PRIOR TO MIXING WITH OTHER WASTESTREAMS
008	CHLORINE,FREE AVAILABLE	1 EVERY 2 WEEKS	GRAB	FINAL EFFLUENT PRIOR TO MIXING WITH OTHER WASTESTREAMS
008	CHROMIUM,TOTAL (AS CR)	1 EVERY MONTH	GRAB	FINAL EFFLUENT PRIOR TO MIXING WITH OTHER WASTESTREAMS
008	ZINC,TOTAL (AS ZN)	1 EVERY MONTH	GRAB	FINAL EFFLUENT PRIOR TO MIXING WITH OTHER WASTESTREAMS
008	DURATION OF CHLORINE DISCHARGE	7/WEEK OR DAILY	MEASUREMENT	FINAL EFFLUENT PRIOR TO MIXING WITH OTHER WASTESTREAMS
801	IRON,TOTAL (AS FE)	1 EVERY MONTH	GRAB	COMBINED FINAL EFFLUENT FROM OUTFALLS 001 AND 003

Facility Name: MIDAMERICAN ENERGY COMPANY-COUNCIL BLUFFS

Permit Number: 7820101

Special Monitoring Requirements

Outfall Number	Description
801	IRON,TOTAL (AS FE) THE SAMPLES TESTED FOR IRON SHALL BE GRAB SAMPLES COLLECTED FROM OUTFALLS 001 AND 003 AND COMBINED IN PROPORTION TO THE FLOW RATE OF EACH OUTFALL TO FORM A SINGLE SAMPLE.

Ceriodaphnia and Pimephales Toxicity Effluent Testing

1. For facilities that have not been required to conduct toxicity testing by a previous NPDES permit, the initial annual toxicity test shall be conducted within three (3) months of permit issuance. For facilities that have been required to conduct toxicity testing by a previous NPDES permit, the initial annual toxicity test shall be conducted within twelve months (12) of the last toxicity test.

2. The test organisms that are to be used for acute toxicity testing shall be Ceriodaphnia dubia and Pimephales promelas. The acute toxicity testing procedures used to demonstrate compliance with permit limits shall be those listed in 40 CFR Part 136 and adopted by reference in rule 567--63.1(1). The method for measuring acute toxicity is specified in USEPA. October 2002, Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition. U.S. Environmental Protection Agency, Office of Water, Washington, D.C., EPA 821-R-02-012.

3. The diluted effluent sample must contain a minimum of 98.00 % effluent and no more than 2.00 % of culture water.

4. One valid positive toxicity result will require quarterly testing for effluent toxicity.

5. Two successive valid positive toxicity results or three positive results out of five successive valid effluent toxicity tests will require a toxic reduction evaluation to be completed to eliminate the toxicity.

6. A non-toxic test result shall be indicated as a "1" on the monthly operation report. A toxic test result shall be indicated as a "2" on the monthly operation report. DNR Form 542-1381 shall also be submitted to the DNR field office along with the monthly operation report.

Ceriodaphnia and Pimephales Toxicity Effluent Limits

The 30 day average mass limit of "1" for the parameters Acute Toxicity, Ceriodaphnia and Acute Toxicity, Pimephales means no positive toxicity results.

Definition: "Positive toxicity result" means a statistical difference of mortality rate between the control and the diluted effluent sample. For more information see USEPA. October 2002, Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition, U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA 821-R-01-012.

Compliance Schedule

MidAmerican Energy Company shall achieve compliance with the final effluent iron limits for outfall 801 specified on page **8** of this permit or revise limits based on site-specific information, according to the following schedule:

- MidAmerican Energy Company shall monitor the final effluent discharged through 801 (combined discharge of outfalls 001 and 003) to determine if the discharge can comply with the iron effluent limits. Samples shall be collected and analyzed at the frequency listed on page 10 of the permit for twelve consecutive months beginning in the month of **October 2006.**
- By **April 1, 2007** submit a progress report summarizing the ability of the facility to comply with the effluent limits for iron.
- By **November 1, 2007** you shall submit a report that summarizes all data collected and contains a conclusion as to whether or not the discharge can comply with the iron limits.
- If the report concludes that the facility can comply with the final limits and the department concurs with this conclusion, the iron limits shall be effective **November 2, 2007.**
- If the report concludes that the facility cannot comply with the iron limits, then the report shall describe the steps you will take to achieve compliance with the iron effluent limits. The steps could include a request that the department establish site specific iron limits based on toxicity testing of the final effluent, or the construction of treatment facilities for the removal of iron. A request for site specific iron limits shall be made at the time the report is submitted and shall contain the results of acute toxicity testing conducted on the discharge from outfall 801 (combined discharge of outfalls 001 and 003) together with the concentration of iron in the samples tested. For information regarding the establishment of site-specific iron limits based on the toxicity testing please contact Connie Dou, Water Resources Section, at 515-281-3350 or at connie.dou@dnr.state.ia.us.
- If construction of treatment facilities is deemed necessary, the report shall contain a schedule for completing such construction in the shortest feasible time.

PROHIBITIONS

1. There shall be no discharge of polychlorinated biphenyl compounds such as those used for transformer fluid.

2. There shall be no discharge of the 126 priority pollutants listed in Appendix "A" of 40 CFR Part 423 discharged in cooling tower blowdown as a result of the use of cooling tower maintenance chemicals, except that chromium and zinc may be discharged subject to the effluent limitations and monitoring requirements specified on pages #7 and #10 of this permit.

3. Neither free available chlorine nor total residual chlorine may be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available or total residual chlorine at any one time.

ADDITIONAL MONITORING AND REPORTING REQUIREMENTS

Compliance with the prohibition on discharging priority pollutants in cooling tower blowdown-outfall 008 (page 14, #2) may be demonstrated either by sampling and analysis of the cooling tower blowdown or by certification that the discharge complies with this requirement as follows:

a. If compliance is to be demonstrated by sampling and analysis, the permittee shall analyze a sample of cooling tower blowdown at least once every six (6) months for each of the 126 priority pollutants listed in Appendix "A" of 40 CFR Part 423. These samples shall consist of cooling tower blowdown collected at a point prior to its mixing with any other water or wastewater and at a time that is representative of normal facility operations. Results of this monitoring shall be submitted with the monthly operation report.

b. As an alternative to the monitoring specified in part "a", the permittee may submit an evaluation that demonstrates that there is no detectable amount of any of the 126 priority pollutants, except chromium and zinc, in cooling tower blowdown resulting from chemicals used for cooling tower maintenance. If the evaluation is approved by the department, the permittee may certify compliance by submitting the following statement at least once each six (6) months with the monthly operation report:

"I certify to the best of my knowledge and belief that no detectable concentrations of the 126 priority pollutants listed in Appendix "A" of 40 CFR Part 423, except as specifically authorized by the NPDES permit, were discharged in cooling tower blowdown as a result of the use of cooling tower maintenance chemicals since filing the last report."

STORM WATER DISCHARGE REQUIREMENTS

This section authorizes the discharge of storm water from industrial activity associated with steam electric power generating facilities, including coal handling areas.

PART I. DESCRIPTION OF DISCHARGES COVERED UNDER THIS PERMIT

A. DISCHARGES COVERED UNDER THIS PERMIT.

This section shall apply to storm water discharges from steam electric power generating facilities, including coal handling areas.

B. STORM WATER DISCHARGE NOT ASSOCIATED WITH INDUSTRIAL ACTIVITY

Storm water discharge associated with industrial activity authorized by this permit may be combined with other sources of storm water that are not classified as associated with industrial activity pursuant to 40 CFR 122.26(b)(14).

C. LIMITATION ON COVERAGE

Unless authorized elsewhere in this NPDES permit, the following discharges are not authorized by this permit:

- Storm water discharges from ancillary facilities such as fleet centers, gas turbine stations, and substations that are not contiguous to a steam electric power generating facility are not covered by this permit. Heat capture co-generation facilities are not covered by this permit; however, dual fuel co-generation facilities are included.
- the discharge of hazardous substances or oil resulting from an on-site spill;
- storm water discharge associated with industrial activity from construction activity, specifically any land disturbing activity of five or more acres;

D. NON-STORM WATER DISCHARGES

The following non-storm water discharges are authorized by this permit provided the non-storm water component of the discharge is in compliance with the conditions in Part III.A.3.g. of the pollution prevention plan required by this permit:

discharges from fire fighting activities; fire hydrant flushing; potable water sources including waterline flushing; drinking fountain water, uncontaminated compressor condensate, irrigation drainage; lawn watering; routine external building washdown that does not use detergents or other compounds; pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used; air conditioning condensate; compressor condensate; uncontaminated springs; uncontaminated ground water; and foundation or footing drains where flows are not contaminated with process materials such as solvents.

PART II. SPECIAL CONDITIONS

A. ADDITIONAL REQUIREMENTS FOR FACILITIES WITH SALT STORAGE

Storage piles of salt used for deicing or other commercial or industrial purposes and that generate a storm water discharge to waters of the United States shall be enclosed or covered to prevent exposure to precipitation, except for exposure resulting from adding or removing materials from the pile. Dischargers shall demonstrate compliance with this provision as expeditiously as practicable, but in no event later than 3 years after the date of permit issuance.

PART III. STORM WATER POLLUTION PREVENTION PLAN

A storm water pollution prevention plan shall be developed. Storm water pollution prevention plans will be prepared in accordance with good engineering practices. The plan will identify potential sources of pollution that may reasonably be expected to affect the quality of storm water discharge associated with industrial activity from the facility. In addition, the plan will describe and ensure the implementation of practices that are to be used to reduce the pollutants in storm water discharge associated with industrial activity at the facility and to assure compliance with the terms and conditions of this permit. Facilities must implement the provisions of the storm water pollution prevention plan required under this part as a condition of this permit.

A. CONTENTS OF THE STORM WATER POLLUTION PREVENTION PLAN

The plan shall include, at a minimum, the following items.

1. Pollution Prevention Team. Each plan shall identify a specific individual or individuals within the facility organization as members of a storm water Pollution Prevention Team that are responsible for developing the storm water pollution prevention plan and assisting the facility or plant manager in its implementation, maintenance, and revision. The plan shall clearly identify the responsibilities of each team member. The activities and responsibilities of the team shall address all aspects of the facility's storm water pollution prevention plan.

2. Description of Potential Pollutant Sources. Each plan shall provide a description of potential sources which may reasonably be expected to add significant amounts of pollutants to storm water discharges or which may result in the discharge of pollutants during dry weather from separate storm sewers draining the facility. Each plan shall identify all activities and significant materials which may potentially be significant pollutant sources. Each plan shall include, at a minimum:

a. **Drainage.** A site map showing locations of the following, as they apply to the facility: The outfall locations and the types of discharges contained in the drainage areas of the outfalls, and an outline of the drainage area of each storm water outfall that is within the facility boundaries (and indicating the direction of storm water flow); processing areas and buildings; treatment ponds; locations where significant materials are exposed to precipitation; storage tanks; scrap yards, and general refuse areas; fuel storage and distribution areas; vehicle and equipment maintenance and storage areas; loading/unloading areas; locations used for treatment, storage or disposal of wastes; location of short and long term storage of general materials (including but not limited to: supplies, construction materials, plant equipment, oils, fuels, used and unused solvents, cleaning materials, paint, water treatment chemicals, fertilizers, and pesticides); landfills; location of construction sites; locations of stock pile areas (such as coal piles and limestone piles); locations where major spills or leaks identified under Part III.A.2.c.(**Spills and Leaks**) of this permit have occurred; surface water bodies; and existing structural control measures to reduce pollutants in storm water runoff (such as bermed areas, grassy swales, etc.).

For each storm water outfall identify the types of pollutants which are likely to be present in the storm water discharges. Factors to consider include the toxicity of a chemical; quantity of chemicals used, produced or discharged; the likelihood of contact with storm water; and history of significant leaks or spills of toxic or hazardous pollutants. Flows with a significant potential for causing erosion shall be identified.

b. **Inventory of Exposed Materials.** an inventory of the types of materials handled at the site that potentially may be exposed to precipitation. Such inventory shall include a narrative description of "significant materials" that have been handled, treated, or disposed of in a manner to allow exposure to storm water beginning 3 years prior to the issuance date of this permit to the present, method and location of on-site storage or disposal; materials management practices employed to minimize contact of materials with storm water runoff beginning 3 years prior to the issuance date of this permit to the present; the location and a description of existing structural and nonstructural control measures to reduce pollutants in storm water runoff; and a description of any treatment the storm water receives.

c. **Spills and Leaks** a list of any "hazardous condition"[1] occurrence(s) at areas that are exposed to precipitation or that otherwise drain to a storm water conveyance at the facility beginning 3 years prior to the issuance date of this permit. Such list shall be updated as appropriate during the term of the permit.

d. **Sampling Data** a summary of any existing discharge sampling data describing pollutants in storm water collected 5 years prior to the permit issuance date, and actual sampling data obtained for this permit, shall be included in the storm water pollution prevention plan. All sampling data shall be held for a period of at

e. **Risk Identification and Summary of Potential Pollutant Sources** A narrative description of the potential pollutant sources from the following activities: loading and unloading operations; outdoor storage activities; outdoor manufacturing or processing activities; significant dust or particulate generating processes; and onsite waste disposal practices. The description shall specifically list any significant potential source of pollutants at the site and for each potential source, any pollutant or pollutant parameter (e.g., total suspended solids, copper, etc.) of concern shall be identified.

3. Measures and Controls. Each facility covered by this permit shall develop a description of storm water management controls appropriate for the facility, and implement such controls. The appropriateness and priorities of controls in a plan shall reflect identified potential sources of pollutants at the facility. The

(1) ____________________

[1] "Defined in PartVI of this permit

description of storm water management controls shall address the following minimum components, including a schedule for implementing such controls:

a. **Good Housekeeping.** Good housekeeping requires the maintenance of areas which may contribute pollutants to storm water discharges in a clean, orderly manner. The following areas must be specifically addressed:

(1) Fugitive Dust Emissions - The plan must describe measures that prevent or minimize fugitive dust emissions from coal handling areas. The permittee shall consider establishing procedures to minimize offsite tracking of coal dust. To prevent offsite tracking the facility may consider specially designed tires, or washing vehicles in a designated area before they leave the site, and controlling the wash water.

(2) Delivery Vehicles. - The plan must describe measures that prevent or minimize contamination of storm water runoff from delivery vehicles arriving on the plant site. At a minimum the permittee should consider the following:

(a) Develop procedures for the inspection of delivery vehicles arriving on the plant site, and ensure overall integrity of the body or container; and

(b) Develop procedures to deal with leakage or spillage from vehicles or containers, and ensure that proper protective measures are available for personnel and environment.

(3) Fuel Oil Unloading Areas. - The plan must describe measures that prevent or minimize contamination of storm water runoff from fuel oil unloading areas. At a minimum the facility operator must consider using the following measures, or an equivalent:

(a) Use containment curbs in unloading areas;

(b) During deliveries station personnel familiar with spill prevention and response procedures must be present to ensure that any leaks or spills are immediately contained and cleaned up; and

(c) Use spill and overflow protection (drip pans, drip diapers, and/or other containment devices shall be placed beneath fuel oil connectors to contain any spillage that may occur during deliveries or due to leaks at such connectors).

(4) Chemical Loading/Unloading Areas. - The plan must describe measures that prevent or minimize the contamination of storm water runoff from chemical loading/unloading areas. Where practicable, chemical loading/unloading areas should be covered, and chemicals should be stored indoors. At a minimum the permittee must consider using the following measures or an equivalent:

(a) Use containment curbs at chemical loading/unloading areas to contain spills; and

(b) During deliveries station personnel familiar with spill prevention and response procedures must be present to ensure that any leaks or spills are immediately contained and cleaned up.

(5) Miscellaneous Loading/Unloading Areas. - The plan must describe measures that prevent or minimizes the contamination of storm water runoff from loading and unloading areas. The facility may consider covering the loading area, minimizing storm water run-on to the loading area by grading, berming, or curbing the area around the loading area to direct storm water away from the area, or locate the loading/unloading equipment and vehicles so that leaks can be contained in existing containment and flow diversion systems.

(6) Liquid Storage Tanks. – The plan must describe measures that prevent or minimize contamination of storm water runoff from above ground liquid storage tanks. At a minimum the facility operator must consider employing the following measures or an equivalent:

(a) Use protective guards around tanks;

(b) Use containment curbs;

(c) Use spill and overflow protection (drip pans, drip diapers, and/or other containment devices shall be placed beneath chemical connectors to contain any spillage that may occur during deliveries or due to leaks at such connectors); and

(d) Use dry cleanup methods.

(7) <u>Large Bulk Fuel Storage Tanks</u>. - The plan must describe measures that prevent or minimize contamination of storm water runoff from liquid storage tanks. At a minimum the facility operator must consider employing the following measures, or an equivalent:

(a) Comply with applicable State and Federal laws, including Spill Prevention Control and Countermeasures (SPCC); and

(b) Containment berms.

(c) The plan must describe measures to reduce the potential for an oil spill, or a chemical spill, or reference the appropriate section of their SPCC plan. At a minimum the structural integrity of all above ground tanks, pipelines, pumps and other related equipment shall be visually inspected on a weekly basis. All repairs deemed necessary based on the findings of the inspections shall be completed immediately to reduce the incidence of spills and leaks occurring from such faulty equipment.

(8) <u>Oil Bearing Equipment in Switchyards</u>. - The plan must describe measures to reduce the potential for storm water contamination from oil bearing equipment in switchyard areas. The facility operator may consider level grades and gravel surfaces to retard flows and limit the spread of spills; collection of storm water runoff in perimeter ditches.

(9) <u>Residue Hauling Vehicles</u>. All residue hauling vehicles shall be inspected for proper covering over the load, adequate gate sealing and overall integrity of the body or container. Vehicles without load coverings or adequate gate sealing, or with leaking containers or beds must be repaired as soon as practicable.

(10) <u>Ash Loading Areas</u>. Plant procedures shall be established to reduce and/or control the tracking of ash or residue from ash loading areas including, where practicable, requirements to clear the ash building floor and immediately adjacent roadways of spillage, debris and excess water before each loaded vehicle departs.

(11) <u>Areas Adjacent to Disposal Ponds or Landfills.</u> The plan must describe measures that prevent or minimize contamination of storm water runoff from areas adjacent to disposal ponds or landfills. The facility must develop procedures to

(a) Reduce ash residue which may be tracked on to access roads traveled by residue trucks or residue handling vehicles; and

(b) Reduce ash residue on exit roads leading into and out of residue handling areas.

(12) <u>Landfills, Scrapyards, Surface Impoundments, Open Dumps, General Refuse Sites.</u> The plan must address landfills, scrapyards, surface impoundments, open dumps and general refuse sites.

(13) <u>Maintenance Activities -</u> vehicle maintenance activities performed on the plant site, the permittee shall use Best Management Practices (BMPs). I

(14) <u>Material Storage Areas</u>. The plan must describe measures that prevent or minimize contamination of storm water from material storage areas (including areas used for temporary storage of miscellaneous products, and construction materials stored in lay down areas). The facility operator may consider flat yard grades, runoff collection in graded swales or ditches, erosion protection measures at steep outfall sites (e.g., concrete chutes, riprap, stilling basins), covering lay down areas, storing the materials indoors, covering the material with a temporary covering made of polyethylene, polyurethane, polypropylene, or hypalon. Storm water run-on may be minimized by constructing an enclosure or building a berm around the area.

b. **Preventive Maintenance** – A preventive maintenance program shall be implemented and shall include timely inspection and maintenance of storm water management devices (e.g., cleaning oil/water separators, catch basins) as well as inspecting and testing facility equipment and systems to uncover conditions that could cause breakdowns or failures resulting in discharges of pollutants to surface waters, and ensuring appropriate maintenance of such equipment and systems.

c. **Spill Prevention and Response Procedures** – Areas where potential spills which can contribute pollutants to storm water discharges can occur, and their accompanying drainage points, shall be identified clearly in the storm water pollution prevention plan. Where appropriate, specifying material handling procedures, storage requirements, and use of equipment such as diversion valves in the plan should be considered. Procedures for cleaning up spills shall be identified in the plan and made available to the appropriate personnel. The necessary equipment to implement a clean up a spill should be available to personnel.

d. **Inspections** – In addition to or as part of the comprehensive site evaluation qualified facility personnel shall be identified to inspect the following areas on a monthly basis: coal handling areas, loading/unloading areas, switchyards, fueling areas, bulk storage areas, ash handling areas, areas adjacent to disposal ponds and landfills, maintenance areas, liquid storage tanks, and long term and short term material storage areas. A set of tracking or follow-up procedures shall be used to ensure that appropriate actions are taken in response to the inspections. Records of inspections shall be maintained onsite.

e. **Employee Training** – Employee training programs shall inform personnel responsible for implementing activities identified in the storm water pollution prevention plan or otherwise responsible for storm water management at all levels of responsibility of the components and goals of the storm water pollution prevention plan. Training should address topics such as goals of the pollution prevention plan, spill prevention and control, proper handling procedures for hazardous wastes, good housekeeping and material management practices, and storm water sampling techniques. The pollution prevention plan shall identify periodic dates for such training, but in all cases training must be held at least annually.

f. **Recordkeeping and Internal Reporting Procedures** – A description of incidents (such as spills, or other discharges), along with other information describing the quality and quantity of storm water discharges shall be included in the plan required under this part. Inspections and maintenance activities shall be documented and records of such activities shall be incorporated into the plan.

g. **Non-storm Water Discharges**

(1) The plan shall include a certification that the discharge has been tested or evaluated for the presence of non-storm water discharges. The certification shall include the identification of potential significant sources of non-storm water at the site, a description of the results of any test and/or evaluation for the presence of non-storm water discharges, the evaluation criteria or testing method used, the date of any testing and/or evaluation, and the onsite drainage points that were directly observed during the test. Certifications shall be signed in accordance with Standard Condition # 22 (Signatory Requirements) of this permit.

(2) Except for flows from fire fighting activities, sources of non-storm water listed in Part I.D. of this permit that are combined with storm water discharges associated with industrial activity must be identified in the plan. The plan shall identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

h. **Sediment and Erosion Control** – The plan shall identify areas which, due to topography, activities, or other factors, have a high potential for significant soil erosion, and identify structural, vegetative, and/or stabilization measures to be used to limit erosion.

i. **Management of Runoff** – The plan shall contain a narrative consideration of the appropriateness of traditional storm water management practices (practices other than those which control the generation or source(s) of pollutants) used to divert, infiltrate, reuse, or otherwise manage storm water runoff in a manner that reduces pollutants in storm water discharges from the site. The plan shall provide that measures the permittee determines to be reasonable and appropriate shall be implemented and maintained. The potential of various sources at the facility to contribute pollutants to storm water discharges associated with industrial activity shall be considered when determining reasonable and appropriate measures. Appropriate measures may include: vegetative swales and practices, reuse of collected storm water (such as for a process or as an irrigation source), inlet controls (such as oil/water separators), snow management activities, infiltration devices, wet detention/retention devices, or other equivalent measures.

4. Comprehensive Site Compliance Evaluation. Qualified personnel shall conduct site compliance evaluations at appropriate intervals specified in the plan, but in no case less than once a year. Such evaluations shall provide:

a. Areas contributing to a storm water discharge associated with industrial activity shall be visually inspected for evidence of, or the potential for, pollutants entering the drainage system. Measures to reduce pollutant loading shall be evaluated to determine whether they are adequate and properly implemented in accordance with the terms of the permit or whether additional control measures are needed. Structural storm water management measures, sediment and erosion control measures, and other structural pollution prevention measures identified in the plan shall be observed to ensure that they are operating correctly. A visual evaluation of equipment needed to implement the plan, such as spill response equipment, shall be made.

b. Based on the results of the evaluation, the description of potential pollutant sources identified in the plan in accordance with Part III.A.2. of this permit (Description of Potential Pollutant Sources) and pollution prevention measures and controls identified in the plan in accordance with Part III.A.3. of this permit (Measures and Controls) shall be revised as appropriate within 2 weeks of such evaluation and shall provide for implementation of any changes to the plan in a timely manner, but in no case more than 12 weeks after the evaluation.

c. A report summarizing the scope of the evaluation, personnel making the evaluation, the date(s) of the evaluation, major observations relating to the implementation of the storm water pollution prevention plan, and actions taken shall be made and retained as part of the storm water pollution prevention plan for at least 3 years from the date of the evaluation. The report shall identify any incidents of noncompliance. Where a report does not identify any incidents of noncompliance, the report shall contain a certification that the facility is in compliance with the storm water pollution prevention plan and this permit. The report shall be signed in accordance with Part .VII.E. (Signatory Requirements) of this permit.

d. Where compliance evaluation schedules overlap with inspections the compliance evaluation may be conducted in place of one such inspection.

B. ADDITIONAL POLLUTION PREVENTION PLAN REQUIREMENTS

In addition to the previously specified contents of the pollution prevention plan, the storm water pollution prevention plan shall include a complete discussion of measures taken to conform with the following applicable guidelines:

1. Requirements for Storm Water Discharge associated With Industrial Activity that Discharge Into or Through Municipal Separate Storm Sewer Systems Serving a Population of 100,000 or More.

a. Facilities covered by this permit must comply with applicable requirements in municipal storm water management programs developed under an NPDES permit issued for the discharge from the municipal separate storm sewer system that receives the facility's discharge, provided the discharger has been notified of such conditions.

b. Permittees that discharge storm water associated with industrial activity through a municipal separate storm sewer system serving a population of 100,000 or more, or a municipal system designated by the Department shall make the pollution prevention plan available to the municipal operator of the system upon request.

2. Requirements for storm water discharge associated with industrial activity from facilities subject to Emergency Planning and Community Right-to-Know Act (EPCRA) Section 313 Requirements are found in Appendix A of this permit.

C. DEADLINES FOR PLAN PREPARATION AND COMPLIANCE

Except where construction is necessary, all facilities shall prepare and implement the plan no later than **270** days after the issuance date shown on page 1 of this permit.

Where construction is necessary to implement measures required by the plan, the plan shall contain a schedule that provides for compliance as expeditiously as practicable, but no later than **3 years after permit issuance.** Where construction is included in the plan, the schedule shall include appropriate non-structural and/or temporary controls to be implemented in the affected portion(s) of the facility prior to completion of the permanent control measures.

D. SIGNATURE AND PLAN REVIEW

1. Signature / Location The plan shall be signed in accordance with the specifications outlined under Standard Condition # 22 - Signatory Requirements of this permit. The plan shall be retained on-site at the

facility that generates the storm water discharge in accordance with Part V. D. - Retention of Records of this permit. For inactive facilities, the plan may be kept at the nearest office of the permittee.

2. Availability The permittee shall make the storm water pollution prevention plan, annual site compliance inspection report, Comprehensive Site Compliance Evaluation Reports, or other information available upon request to the Department.

3. Required Modifications The Department may notify the permittee at any time that the plan does not meet one or more of the minimum requirements of this permit. Such notification shall identify those provisions of the permit that are not being met, and identify which provisions of the plan require modification to meet the minimum requirements of this permit. Within 30 days of such notification, (or as otherwise provided by the Department), the permittee shall make the required changes to the plan and shall submit to the Department a written certification that the requested changes have been made.

E. Keeping Plans Current

1. The permittee shall amend the plan whenever there is a change in design, construction, operation, or maintenance, that has a significant effect on the potential for the discharge of pollutants to the waters of the United States or if the storm water pollution prevention plan proves to be ineffective in eliminating or significantly minimizing the discharge of pollutants from sources identified under Part III. A. 2. of this permit, or in otherwise achieving the general objectives of controlling pollutants in storm water discharge associated with industrial activity. New owners shall review the existing plan and make appropriate changes.

2. The storm water pollution prevention plan required by this permit must be modified within 14 calendar days of the occurrence of any "hazardous condition" to: provide a description of the release, the circumstances leading to the release, and the date of the release. In addition, the plan must be reviewed by the permittee to identify measures to prevent the reoccurrence of such a condition and to respond to such discharges, and the plan must be modified where appropriate.

F. Signatory Requirements

The storm water pollution prevention plan shall be certified in accordance with the Signatory Requirements - Standard Condition # 22 of this permit.

PART IV. EFFLUENT LIMITATIONS

The permittee shall comply with the following effluent limitations, if applicable:

A. Coal Pile Runoff

Any discharge of coal pile runoff shall not exceed a maximum concentration at any time of 50 mg/L total suspended solids. Coal pile runoff shall not be diluted with storm water or other flows in order to meet this limitation. The pH of such discharges shall be within the range of 6.0 to 9.0. Any untreated overflow from facilities designed, constructed and operated to treat the volume of coal pile runoff that is associated with a 10-year, 24-hour rainfall event shall not be subject to the 50 mg/l limitation for total suspended solids.

B. Storm Water Discharges Subject To New Source Performance Standards

Storm water discharges subject to New Source Performance Standards (NSPS) include: runoff from material storage piles at cement manufacturing facilities [40 CFR Part 411 Subpart C (established February 23, 1977)]; contaminated runoff from phosphate fertilizer manufacturing facilities [40 CFR Part 418 Subpart A (established April 8, 1974)]; coal pile runoff at steam electric generating facilities [40 CFR Part 423 (established November 19, 1982)]; and runoff from asphalt emulsion facilities [40 CFR Part 443 Subpart A (established July 24, 1975)]. NSPS apply only to discharges from those facilities or installations that were constructed after the promulgation of NSPS. For example, storm water discharges from areas where the production of asphalt paving and roofing emulsions occurs are subject to NSPS only if the asphalt emulsion facility was constructed after July 24, 1975. Effluent limits from NSPS take precedence over any limits imposed by this permit.

PART V. MONITORING AND REPORTING REQUIREMENTS

This permit may require both visual and analytical monitoring. Each type of monitoring is explained below. Analyses which are required to be reported to the department as a result of this permit must be performed by a laboratory certified by the State of Iowa to perform the analysis[2]. All analyses whether or not reported to this

(1)

[2] see Iowa Administrative Code [567].- Chapter 83

department, must be analyzed using approved methods specified in 40 CFR Part 136.3. All collected samples shall comply with container requirements, preservation techniques, and holding time requirements specified in 40 CFR Part 136.3.

A. Analytical Monitoring Requirements

1. General Monitoring permittees with steam electric power generating facilities must monitor their storm water discharges associate with industrial activity at least quarterly (4 times per year) during 2nd and 4th year of this permit except as provided in paragraphs c. sampling waiver, d. representative discharge, and e. alternative certification, steam electric power generating facilities are required to monitor their storm water discharges for the pollutant of concern listed in Table O-1 below. Facilities must report in accordance with paragraph f reporting. In addition to the parameter listed in Table O-1 below, the permittee shall provide the date and duration (in hours) of the storm event(s) sampled; rainfall measurements or estimates (in inches) of the storm event which generated the sampled runoff; the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event; and an estimate of the total volume (in gallons) of the discharge sampled;

Table O-1.

Monitoring Requirements for

Steam Electric Power Generating Facilities

Pollutant of Concern	Cut-Off Concentration
Total Recoverable Iron	1.0 mg/L

a. Monitoring Periods Quarterly samples shall be collected for the following periods: January through March, April through June, July through September, and October through December.

b. Sample Type A minimum of one grab sample shall be taken. All samples shall be collected from a discharge resulting from a storm event that is greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event. The required 72-hour storm event interval is waived where the preceding measurable storm event did not result in a measurable discharge from the facility. The required 72-hour storm event interval may also be waived where the permittee documents that less than a 72-hour interval is representative for local storm events during the season when sampling is being conducted. The grab sample shall be taken during the first 30 minutes of the discharge. If the collection of a grab sample during the first 30 minutes is impracticable, a grab sample can be taken during the first hour of the discharge, and the discharger shall submit with the monitoring report a description of why a grab sample during the first 30 minutes was impracticable. If storm water discharge associated with industrial activity commingle with process or non-process water, then where practicable permittees must attempt to sample the storm water discharge before it mixes with the non-storm water discharge.

c. Sampling Waiver

(1) Adverse Conditions - When a discharger is unable to collect samples within a specified sampling period due to adverse climatic conditions, the discharger shall collect a substitute sample from a separate qualifying event in the next period and submit the data along with data for the routine sample in that period. Adverse weather conditions that may prohibit the collection of samples include weather conditions that create dangerous conditions for personnel (such as local flooding, high winds, hurricane, tornadoes, electrical storms, etc.) or otherwise make the collection of a sample impracticable (drought, extended frozen conditions, etc.).

(2) Low Concentration Waiver - When the average concentration for a pollutant calculated from all monitoring data collected from an outfall during the second year after permit issuance is less than the corresponding cut off concentration for that pollutant listed in Table O-1 a facility may waive monitoring and reporting requirements in the fourth year of this permit.

(3) When a discharger is unable to conduct quarterly storm water sampling at an inactive and unstaffed site, the operator of the facility may exercise a waiver of the monitoring requirements as long as the facility remains inactive and unstaffed. The pollution prevention plan must include, in lieu of monitoring data, a statement that the site is inactive and unstaffed so that collecting a sample during a qualifying event is not possible.

d. Representative Discharge When a facility has two or more outfalls that, based on a consideration of industrial activity, significant materials, and management practices and activities within the area drained by the outfall, the permittee reasonably believes discharge substantially identical effluents, the permittee may test the effluent of one of such outfalls and report that the quantitative data also applies to the substantially identical outfall(s) provided that the permittee includes in the storm water pollution prevention plan a description of the location of the outfalls and explains in detail why the outfalls are expected to discharge substantially identical effluents. In addition, for each outfall that the permittee believes is representative, an estimate of the size of the drainage area (in square feet) and an estimate of the runoff coefficient of the drainage area [e.g., low (under 40 percent), medium (40 to 65 percent), or high (above 65 percent)] shall be provided in the plan. The permittee shall include the description of the location of the outfalls, explanation of why outfalls are expected to discharge substantially identical effluents, and estimate of the size of the drainage area and runoff coefficient.

e. Alternative Certification A discharger is not subject to the above monitoring requirements provided the discharger makes a certification for a given outfall or on a pollutant-by-pollutant basis that material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, industrial machinery or operations, or significant materials from past industrial activity, that are located in areas of the facility within the drainage area of the outfall are not presently exposed to storm water and are not expected to be exposed to storm water for the certification period. Such certification must be retained in the storm water pollution prevention plan. This certification option is not applicable to compliance monitoring requirements associated with effluent limitations.

f. Reporting Permittees with monitoring requirements under Part V.A.1. shall retain the monitoring results in their current pollution prevention plan. Any monitoring information shall be made available to the Department upon request.

2. **Compliance Monitoring Requirements**. Permittees with point sources of coal pile runoff associated with steam electric power generation must monitor these storm water discharges for the presence of TSS and for pH at least annually (one time per year). Facilities must report in accordance with paragraph c. **reporting**. In addition to the parameters listed above, the permittee shall provide the date and duration (in hours) of the storm event(s) sampled; rainfall measurements or estimates (in inches) of the storm event that generated the sampled runoff; the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event; and an estimate of the total volume (in gallons) of the discharge sampled.

a. **Sample Type.** A minimum of one grab sample shall be taken. All such samples shall be collected from the discharge resulting from a storm event that is greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event. The grab sample shall be taken during the first 30 minutes of the discharge. If the collection of a grab sample during the first 30 minutes is impracticable, a grab sample can be taken during the first hour of the discharge, and the discharger shall submit with the monitoring report a description of why a grab sample during the first 30 minutes was impracticable.

b. **Sampling Waiver** When a discharger is unable to collect samples of coal pile runoff due to adverse climatic conditions, the discharger shall collect a substitute sample from a separate qualifying event in the next period and submit this data along with the data for the routine sample in that period. Adverse weather conditions that may prohibit the collection of samples include weather conditions that create dangerous conditions for personnel (such as local flooding, high winds, hurricane, tornadoes, electrical storms, etc.) or otherwise make the collection of a sample impracticable (drought, extended frozen conditions, etc.).

c. **Reporting.** Permittees with point sources of coal pile runoff associated with steam electric power generation shall submit monitoring results annually. Reports are to be submitted to the appropriate IDNR Field Office.

B. QUARTERLY VISUAL EXAMINATION OF STORM WATER QUALITY.

Facilities shall perform and document a quarterly, visual examination of storm water discharge associated with industrial activity from each outfall, except discharges exempted below. The examination must be made at least once in each of the following periods: January through March; April through June; July through September; and October through December during daylight hours unless there is insufficient rainfall or snow melt to produce a runoff event.

1. Examinations shall be made of samples collected within the first 30 minutes (or as soon thereafter as practical, but not to exceed one hour) of when the runoff or snowmelt begins discharging. The examination must be conducted in a well lit area. No analytical tests are required to be performed on the samples. All such samples shall be collected from the discharge resulting from a storm event that is greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event. Where practicable the same individual should carry out the collection and examination of discharges for entire permit term.

2. Visual examination reports must be maintained on-site in the pollution prevention plan. The report shall include the examination date and time, examination personnel, the nature of the discharge (i.e., runoff or snow melt), visual quality of the storm water discharge including observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of storm water pollution, and probable sources of any observed storm water contamination.

3. When a facility has two or more outfalls that, based on a consideration of industrial activity, significant materials, and management practices and activities within the area drained by the outfall, the permittee reasonably believes discharge substantially identical effluents, the permittee may collect a sample of effluent of one of such outfalls and report that the examination data also applies to the substantially identical outfalls provided that the permittee includes in the storm water pollution prevention plan a description of the location of the outfalls and explaining in detail why the outfalls are expected to discharge substantially identical effluents. In addition, for each outfall that the permittee believes is representative, an estimate of the size of the drainage area (in square feet) and an estimate of the runoff coefficient of the drainage area (e.g., low (under 40 percent), medium (40 to 65 percent) or high (above 65 percent)) shall be provided in the plan.

4. When a discharger is unable to collect samples over the course of the visual examination period as a result of adverse climatic conditions, the discharger must document the reason for not performing the visual examination and retain this documentation with the records of the visual examination. Adverse weather conditions which may prohibit the collection of samples include weather conditions that create dangerous conditions for personnel (such as local flooding, high winds, hurricane, tornadoes, electrical storms, etc.) or otherwise make the collection of a sample impracticable (drought, extended frozen conditions, etc.).

5. When a discharger is unable to conduct visual storm water examinations at an inactive and unstaffed site, the operator of the facility may exercise a waiver of the monitoring requirement as long as the facility remains inactive and unstaffed. The facility must maintain a certification with the pollution prevention plan stating that the site is inactive and unstaffed so that performing visual examinations during a qualifying event is not feasible.

C. Records Contents

Records for analytical monitoring information shall include:

1. the date, exact place, and time of sampling or measurements;
2. the name(s) of the individual(s) who performed the sampling or measurements;
3. the date(s) analyses were performed;
4. the time(s) analyses were initiated;
5. the initials or name(s) of the individual(s) who performed the analyses;
6. references and written procedures, when available, for the analytical techniques or methods used; and
7. the results of such analyses, including copies of the original laboratory sheets and instrument readouts if available.

D. Retention of Records

The permittee shall retain records of all monitoring information, copies of all reports required by this permit, and records of all data used to complete the application for this permit for a period of at least five (5) years from the date of sample, measurement, evaluation or inspection, report, or application. This period may be extended by request of the epartment at any time and shall be automatically extended during periods of enforcement action. Permittees must submit any such records to the Department upon request.

The permittee shall retain the pollution prevention plan developed in accordance with this permit for at least 3 years after the last modification or amendment is made to the plan, and at least 1 year after this permit expires.

PART VI. DEFINITIONS

1. Best Management Practices ("BMPs") means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control facility site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.
2. Bypass means the intentional diversion of waste streams from any portion of a treatment facility.
3. Coal pile runoff means the rainfall runoff from or through any coal storage pile.
4. CWA means Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972).
5. Department means the Iowa Department of Natural Resources (IDNR) or an authorized representative.
6. Hazardous Condition includes, but is not limited to: releases of oil or hazardous substances in excess of reportable quantities under Section 311 of the Clean Water Act (see 40 CFR 110.10 and CFR 117.21) or Section 102 of CERCLA (see 40 CFR 302.4).
7. Landfill means an area of land or an excavation in which wastes are placed for permanent disposal, and that is not a land application unit, surface impoundment, injection well, or waste pile.
8. Land application unit means an area where wastes are applied onto or incorporated into the soil surface (excluding manure spreading operations) for treatment or disposal.
9. Large and medium municipal separate storm sewer system means all municipal separate storm sewers that are either.
   (1) located in an incorporated place (city) with a population of 100,000 or more as determined by the latest Decennial Census by the Bureau of Census (these cities are listed in Appendices F and G of 40 CFR Part 122); or
   (2) located in the counties with unincorporated urbanized populations of 100,000 or more, except municipal separate storm sewers that are located in the incorporated places, townships or towns within such counties (these counties are listed in Appendices H and I of 40 CFR Part 122); or
   (3) owned or operated by a municipality other than those described in paragraph (1) or (2) above and that are designated by the Department as part of the large or medium municipal separate storm sewer system.
10. Point source means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.
11. Section 313 water priority chemical means a chemical or chemical categories are pollutants for which EPA has published acute or chronic water quality criteria. See Appendix A of this permit. This appendix was revised based on final rulemaking EPA published in the Federal Register November 30, 1994.
12. Significant materials includes, but is not limited to: raw materials; fuels; materials such as solvents, detergents, and plastic pellets; finished materials such as metallic products; raw materials used in food processing or production; hazardous substances designated under Section 101(14) of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA); any chemical the facility is required to report pursuant to Emergency Planning and Community Right-to-Know Act (EPCRA) Section 313; fertilizers; pesticides; and waste products such as ashes, slag and sludge that have the potential to be released with storm water discharges.
13. Storm water means storm water runoff, snow melt runoff, and surface runoff and drainage.
14. Storm water discharge associated with industrial activity at landfills and land application sites are defined as storm water discharge from facilities that receive or have received waste from the industrial facilities identified under 122.26 (b) (14) (i) - (xi). 122.26 (b) (14) (i) - (xi) identifies those facilities or activities that fall under the definition of storm water discharge associated with industrial activity.

15. <u>Storm water discharge associated with industrial activity</u> means the discharge from any conveyance that is used for collecting and conveying storm water and that is directly related to manufacturing, processing or raw materials storage areas at an industrial plant. The term does not include discharges from facilities or activities excluded from the NPDES program. For the categories of industries identified in paragraphs (i) through (x) of this definition, the term includes, but is not limited to, storm water discharges from industrial plant yards; immediate access roads and rail lines used or traveled by carriers of raw materials manufactured products, waste material, or by-products used or created by the facility; material handling sites; refuse sites; sites used for the application or disposal of process waste waters (as defined at 40 CFR Part 401); sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage, or disposal; shipping and receiving areas; manufacturing buildings; storage areas (including tank farms) for raw materials, and intermediate and finished products; and areas where industrial activity has taken place in the past and significant materials remain and are exposed to storm water. For the categories of industries identified in paragraph (xi) of this definition, the term includes only storm water discharges from all areas (except access roads and rail lines) listed in the previous sentence where material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, or industrial machinery are exposed to storm water. For the purposes of this paragraph, material handling activities include the storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, finished product, by-product or waste product. The term excludes areas located on plant lands separate from the plant's industrial activities, such as office buildings and accompanying parking lots as long as the drainage from the excluded areas is not mixed with storm water drained from the above described areas. Industrial facilities (including industrial facilities that are Federally, State, or municipally owned or operated that meet the description of the facilities listed in paragraphs (i) to (xi) of this definition) include those facilities designated under 122.26(a)(1)(v). The following categories of facilities are considered to be engaging in "industrial activity" for purposes of this subsection.

(i) Facilities subject to storm water effluent limitations guidelines, new source performance standards, or toxic pollutant effluent standards under 40 CFR Subchapter N (except facilities with toxic pollutant effluent standards that are exempted under category (xi) of this definition);

(ii) Facilities classified as Standard Industrial Classifications 24 (except 2434), 26 (except 265 and 267), 28 (except 283 and 285), 29, 311, 32 (except 323), 33, 3441, 373;

(iii) Facilities classified as Standard Industrial Classifications 10 through 14 (mineral industry) including active or inactive mining operations (except for areas of coal mining operations no longer meeting the definition of a reclamation area under 40 CFR 434.11(l) because the performance bond issued to the facility by the appropriate SMCRA authority has been released, or except for areas of non-coal mining operations that have been released from applicable State or Federal reclamation requirements after December 17, 1990) and oil and gas exploration, production, processing, or treatment operations, or transmission facilities that discharge storm water contaminated by contact with or that has come into contact with, any overburden, raw material, intermediate products, finished products, byproducts or waste products located on the site of such operations; inactive mining operations are mining sites that are not being actively mined, but that have an identifiable owner/operator;

(iv) Hazardous waste treatment, storage, or disposal facilities, including those that are operating under interim status or a permit under Subtitle C of RCRA;

(v) Landfills, land application sites, and open dumps that have received any industrial wastes (waste that is received from any of the facilities described under this subsection) including those that are subject to regulation under Subtitle D of RCRA;

(vi) Facilities involved in the recycling of materials, including metal scrap yards, battery reclaimers, salvage yards, and automobile junkyards, including but limited to those classified as Standard Industrial Classification 5015 and 5093;

(vii) Steam electric power generating facilities, including coal handling sites;

(viii) Transportation facilities classified as Standard Industrial Classifications 40, 41, 42 (except 4221-25), 43, 44, 45 and 5171 that have vehicle maintenance shops, equipment cleaning operations, or airport deicing operations. Only those portions of the facility that are either involved in vehicle maintenance (including vehicle rehabilitation, mechanical repairs, painting, fueling, and lubrication), equipment cleaning operations, airport deicing operations, or that are otherwise identified under paragraphs (i) to (vii) or (ix) to (xi) of this subsection are associated with industrial activity;

(ix) Treatment works treating domestic sewage or any other sewage sludge or wastewater treatment device or system, used in the storage treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated to the disposal of sewage sludge that are located within the confines of the facility, with a design flow of 1.0 mgd or more, or required to have an approved pretreatment program under 40 CFR Part 403. Not included are farm lands, domestic gardens or lands used for sludge management where sludge is beneficially reused and that are not physically located in the confines of the facility, or areas that are in compliance with 40 CFR Part 503;

(x) Construction activity including clearing, grading and excavation activities except: operations that result in the disturbance of less than 5 acres of total land area that are not part of a larger common plan of development or sale;

(xi) Facilities under Standard Industrial Classifications 20, 21, 22, 23, 2434, 25, 265, 267, 27, 283, 285, 30, 31 (except 311), 323, 34 (except 3441), 35, 36, 37 (except 373), 38, 39, 4221-25, (and that are not otherwise included within categories (i) to (x)).

16. Upset means an exceptional incident in which there is unintentional and temporary noncompliance with the numeric effluent limitations of this permit because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

17. Waste pile means any noncontainerized accumulation of solid, non-flowing waste that is used for treatment or storage.

18. Waters of the United States means.

All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide;

a. All interstate waters, including interstate wetlands;

b. All other waters such as interstate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:

c. That are or could be used by interstate or foreign travelers for recreational or other purposes;

d. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

e. That are used or could be used for industrial purposes by industries in interstate commerce;

f. All impoundment of waters otherwise defined as waters of the United States under this definition;

g. Tributaries of waters identified in paragraphs (a) through (d) of this definition;

h. The territorial sea; and

i. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) through (f) of this definition,

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA are not waters of the United States).

APPENDIX A

ADDITIONAL REQUIREMENTS FOR STORM WATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITY FROM FACILITIES SUBJECT TO EPCRA SECTION 313 REQUIREMENTS

In addition to the requirements of this permit, storm water pollution prevention plans for facilities subject to reporting requirements under EPCRA Section 313 for chemicals that are classified as 'Section 313 water priority chemicals' as described in the definition section of this permit, unless otherwise exempted, shall describe and ensure the implementation of practices that are necessary to provide for conformance with the following guidelines:

j. In areas where Section 313 water priority chemicals are stored, processed or otherwise handled, appropriate containment, drainage control and/or diversionary structures shall be provided unless otherwise exempted. At a minimum, one of the following preventive systems or its equivalent shall be used:

(1) Curbing, culverting, gutters, sewers, or other forms of drainage control to prevent or minimize the potential for storm water run-on to come into contact with significant sources of pollutants; or

(2) Roofs, covers or other forms of appropriate protection to prevent storage piles from exposure to storm water and wind.

k. In addition to the minimum standards listed above the storm water pollution prevention plan shall include a complete discussion of measures taken to conform with other effective storm water pollution prevention procedures, and applicable State rules, regulations, and guidelines:

(1) Liquid Storage Areas Where Storm Water Comes Into Contact With Any Equipment, Tank, Container, or Other Vessel Used for Section 313 Water Priority Chemicals

(a) No tank or container shall be used for the storage of a Section 313 water priority chemical unless its material and construction are compatible with the material stored and conditions of storage such as pressure and temperature, etc.

(b) Liquid storage areas for Section 313 water priority chemicals shall be operated to minimize discharges of Section 313 chemicals. Appropriate measures to minimize discharges of Section 313 chemicals may include secondary containment provided for at least the entire contents of the largest single tank plus sufficient freeboard to allow for precipitation, a strong spill contingency and integrity testing plan, and/or other equivalent measures.

(2) Material Storage Areas for Section 313 Water Priority Chemicals Other Than Liquids. Material storage areas for Section 313 water priority chemicals other than liquids that are subject to runoff, leaching, or wind shall incorporate drainage or other control features that will minimize the discharge of Section 313 water priority chemicals by reducing storm water contact with Section 313 water priority chemicals.

(3) Truck and Rail Car Loading and Unloading Areas for Liquid Section 313 Water Priority Chemicals. Truck and rail car loading and unloading areas for liquid Section 313 water priority chemicals shall be operated to minimize discharges of Section 313 water priority chemicals. Protection such as overhangs or door skirts to enclose trailer ends at truck loading/unloading docks shall be provided as appropriate. Appropriate measures to minimize discharges of Section 313 chemicals may include: the placement and maintenance of drip pans (including the proper disposal of materials collected in the drip pans) where spillage may occur (such as hose connections, hose reels and filler nozzles) for use when making and breaking hose connections; a strong spill contingency and integrity testing plan; and/or other equivalent measures.

(4) Areas Where Section 313 Water Priority Chemicals Are Transferred, Processed, or Otherwise Handled. Processing equipment and materials handling equipment shall be operated so as to minimize discharges of Section 313 water priority chemicals. Materials used in piping and equipment shall be compatible with the substances handled. Drainage from process and materials handling areas shall minimize storm water contact with Section 313 water priority chemicals. Additional protection such as covers or guards to prevent exposure to wind, spraying or releases from pressure relief vents from causing a discharge of Section 313 water priority chemicals to the drainage system shall be provided as appropriate. Visual inspections or leak tests shall be provided for overhead piping conveying Section 313 water priority chemicals without secondary containment.

Drainage from areas covered by paragraphs (a), (b), (c), or (d) of this part should be restrained by valves or other positive means to prevent the discharge of a spill or other excessive leakage of Section 313 water priority chemicals. Where containment units are employed, such units may be emptied by pumps or ejectors; however, these shall be manually activated.

(a) Flapper-type drain valves shall not be used to drain containment areas. Valves used for the drainage of containment areas should, as far as is practical, be of manual, open-and-closed design.

(b) If facility drainage is not engineered as above, the final discharge of all in-facility storm sewers shall be equipped to be equivalent with a diversion system that could, in the event of an uncontrolled spill of Section 313 water priority chemicals, return the spilled material to the facility.

(c) Records shall be kept of the frequency and estimated volume (in gallons) of discharges from containment areas.

(5) Facility Site Runoff Other Than From Areas Covered By (a), (b), (c), or (d). Other areas of the facility (those not addressed in paragraphs (a), (b), (c), or (d)), from which runoff that may contain Section 313 water priority chemicals or spills of Section 313 water priority chemicals could cause a discharge shall incorporate the necessary drainage or other control features to prevent discharge of spilled or improperly disposed material and ensure the mitigation of pollutants in runoff or leachate.

(6) Preventive Maintenance and Housekeeping. All areas of the facility shall be inspected at specific intervals identified in the plan for leaks or conditions that could lead to discharges of Section 313 water priority chemicals or direct contact of storm water with raw materials, intermediate materials, waste materials or products. In particular, facility piping, pumps, storage tanks and bins, pressure vessels, process and material handling equipment, and material bulk storage areas shall be examined for any conditions or failures that could cause a discharge. Inspection shall include examination for leaks, wind blowing, corrosion, support or foundation failure, or other forms of deterioration or noncontainment. Inspection intervals shall be specified in the plan and shall be based on design and operational experience. Different areas may require different inspection intervals. Where a leak or other condition is discovered that may result in significant releases of Section 313 water priority chemicals to waters of the United States, action to stop the leak or otherwise prevent the significant release of Section 313 water priority chemicals to waters of the United States shall be immediately taken or the unit or process shut down until such action can be taken. When a leak or noncontainment of a Section 313 water priority chemical has occurred, contaminated soil, debris, or other material must be promptly removed and disposed in accordance with Federal, State, and local requirements and as described in the plan.

(7) Facility Security. Facilities shall have the necessary security systems to prevent accidental or intentional entry that could cause a discharge. Security systems described in the plan shall address fencing, lighting, vehicular traffic control, and securing of equipment and buildings.

(8) Training. Facility employees and contractor personnel that work in areas where Section 313 water priority chemicals are used or stored shall be trained in and informed of preventive measures at the facility. Employee training shall be conducted at intervals specified in the plan, but not less than once per year. Training shall address: pollution control laws and regulations, the storm water pollution prevention plan and the particular features of the facility and its operation that are designed to minimize discharges of Section 313 water priority chemicals. The plan shall designate a person who is accountable for spill prevention at the facility and who will set up the necessary spill emergency procedures and reporting requirements so that spills and emergency releases of Section 313 water priority chemicals can be isolated and contained before a discharge of a Section 313 water priority chemical can occur. Contractor or temporary personnel shall be informed of facility operation and design features in order to prevent discharges or spills from occurring.

I. Facilities subject to reporting requirements under EPCRA Section 313 for chemicals that are classified as 'Section 313 water priority chemicals' as described in the definition section of this permit that are handled and stored on-site only in gaseous or non-soluble liquid or solid (at atmospheric pressure and temperature) forms may provide a certification as such in the pollution prevention plan in lieu of the additional requirements for facilities subject to reporting under EPCRA Section 313. Such certification shall include a narrative description of all water priority chemicals and the form in which they are handled and stored, and shall be signed in accordance with Part VII, E, Signatory Requirements of this permit.

APPENDIX B

SECTION 313 WATER PRIORITY CHEMICALS

CAS Number	Common Name
75-07-0	Acetaldehyde
107-02-8	Acrolein
107-13-1	Acrylonitrile
309-00-2	Aldrin[1,4:5,8-Dimethanonaphthalene,1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a hexahydro-(1.alpha.,4.alpha.,4a.beta.,5.alpha.,8.alpha.,8a.beta.)-]
107-05-1	Allyl Chloride
7429-90-5	Aluminum (fume or dust)
7664-41-7	Ammonia
62-53-3	Aniline
120-12-7	Anthracene
7440-36-0	Antimony
7647189	Antimony pentachloride
28300745	Antimony potassium tartrate
7789619	Antimony tribromide
10025919	Antimony trichloride
7783564	Antimony trifluoride
1309644	Antimony trioxide
7440-38-2	Arsenic
1303328	Arsenic disulfide
1303282	Arsenic pentoxide
7784341	Arsenic trichloride
1327533	Arsenic trioxide
1303339	Arsenic trisulfide
1332-21-4	Asbestos (friable)
542621	Barium cyanide
71-43-2	Benzene
92-87-5	Benzidine
100470	Benzonitrile
218019	Benzo(a)phenanthrene
50328	Benzo(a)pyrene
205992	Benzo(b)fluoranthene
205823	Benzo(j)fluoranthene
207089	Benzo(k)fluoranthene
189559	Benzo(rst)pentaphene
56553	Benzo(a)anthracene
100-44-7	Benzyl chloride
7440-41-7	Beryllium
7787475	Beryllium chloride
7787497	Beryllium fluoride
7787555	Beryllium nitrate
111-44-4	Bis(2-chloroethyl) ether
75-25-2	Bromoform
74-83-9	Bromomethane (Methyl bromide)
85-68-7	Butyl benzyl phthalate
7440-43-9	Cadmium
543908	Cadmium acetate
7789426	Cadmium bromide
10108642	Cadmium chloride
7778441	Calcium arsenate
52740166	Calcium arsenite
13765190	Calcium chromate
592018	Calcium cyanide
133-06-2	Captan [1H-Isoindole-1,3(2H)-dione,3a,4,7,7a-tetrahydro-2-[(trichloromethyl)thio]-]
63-25-2	Carbaryl [1-Naphthalenol, methylcarbamate]
75-15-0	Carbon disulfide
1563662	Carbofuran
56-23-5	Carbon tetrachloride
57-74-9	Chlordane [4,7-Methanoindan,1,2,4,5,6,7,8,8 - octachloro-2,3,3a,4,7,7a-hexahydro-]
7782-50-5	Chlorine

59-50-7	4-Chloro 3-methyl phenol	10380297	Cupric sulfate, ammoniated
	p-Chloro-m-cresol	815827	Cupric tartrate
108-90-7	Chlorobenzene	57-12-5	Cyanide
75-00-3	Chloroethane (Ethyl chloride)	506774	Cyanogen chloride
67-66-3	Chloroform	333415	Diazinon
74-87-3	Chloromethane (Methyl chloride)	94-75-7	2,4-D [Acetic acid, (2,4-dichlorophenoxy)-]
95-57-8	2-Chlorophenol	226368	Dibenz(a,h)acridine
106-48-9	4-Chlorophenol	224420	Dibenz(a,j)acridene
75729	Chlorotrifluoromethane	5385751	Dibenzo(a,e)fluoranthene
1066304	Chromic acetate	192654	Dibenzo(a,e)pyrene
11115745	Chromic acid	53703	Dibenzo(a,h)anthracene
10101538	Chromic sulfate	189640	Dibenzo(a,l)pyrene
7440-47-3	Chromium	191300	Dibenzo(a,h)pyrene
1308-14-1	Chromium (Tri)	194592	7, H-Dibenzo(c,g)carbazole
10049055	Chromous chloride	106-93-4	1,2-Dibromoethane (Ethylene dibromide)
7789437	Cobaltous bromide	84-74-2	Dibutyl phthalate
544183	Cobaltous formate	1929733	2,4 D Butoxyethyl ester
14017415	Cobaltous sulfamate	94804	2,4 D Butyl ester
7440-50-8	Copper	2971382	2,4 D Chlorocrotyl ester
108-39-4	m-Cresol	1918009	Dicamba
9548-7	o-Cresol	95-50-1	1,2-Dichlorobenzene
106-44-5	p-Cresol	541-73-1	1,3-Dichlorobenzene
4170303	Crotonaldehyde	106-46-7	1,4-Dichlorobenzene
1319-77-3	Cresol (mixed isomers)	91-94-1	3,3'-Dichlorobenzidine
142712	Cupric acetate	75-27-4	Dichlorobromomethane
12002038	Cupric acetoarsenite	107-06-2	1,2-Dichloroethane (Ethylene dichloride)
7447394	Cupric chloride	75434	Dichlorofluoromethane
3251238	Cupric nitrate	540-59-0	1,2-Dichloroethylene
5893663	Cupric oxalate	120-83-2	2,4-Dichlorophenol
7758987	Cupric sulfate		

78-87-5	1,2-Dichloropropane
10061026	trans-1,3-Dichloropropene
542-75-6	1,3-Dichloropropylene
62-73-7	Dichlorvos [Phosphoric acid, 2,2- dichloroethenyl dimethyl ester]
115-32-2	Dicofol [Benzenemethanol, 4-chloro-.alpha.- (4-chlorophenyl)-.alpha.- (trichloromethyl)-]
177-81-7	Di-(2-ethylhexyl) phthalate (DEHP)
84-66-2	Diethyl phthalate
124403	Dimethylamine
57976	7,12-Dimethylbenz(a)anthracene
105-67-9	2,4-Dimethylphenol
131-11-3	Dimethyl phthalate
534-52-1	4,6-Dinitro-o-cresol
51-28-5	2,4-Dinitrophenol
121-14-2	2,4-Dinitrotoluene
606-20-2	2,6-Dinitrotoluene
117-84-0	n-Dioctyl phthalate
122-66-7	1,2-Diphenylhydrazine (Hydrazobenzene)
94111	2,4-D Isopropyl ester
106-89-8	Epichlorohydrin
1320189	2,4-D Propylene glycol butyl ether ester
330541	Diuron
100-41-4	Ethylbenzene
106934	Ethylene dibromide
50-00-0	Formaldehyde
76-44-8	Heptachlor [1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methano-1H-indene]
118-74-1	Hexachlorobenzene
319846	alpha-Hexachlorocyclohexane
87-68-3	Hexachloro-1,3-butadiene
77-47-4	Hexachlorocyclopentadiene
67-72-1	Hexachloroethane
7647-01-0	Hydrochloric acid
74-90-8	Hydrogen cyanide
7664-39-3	Hydrogen fluoride
193395	Indeno[1,2,3-cd]pyrene
7439-92-1	Lead
301042	Lead acetate
7784409	Lead arsenate
7645252	" "
10102484	" "
7758954	Lead chloride
13814965	Lead fluoborate
7783462	Lead fluoride
10101630	Lead iodide
10099748	Lead nitrate
7428480	Lead stearate
1072351	" "
52652592	" "
7446142	Lead sulfate
1314870	Lead sulfide
592870	Lead thiocyanate
58-89-9	Lindane [Cyclohexane, 1,2,3,4,5,6-hexachloro-

	(1.alpha.,3.beta.,4.alpha.,5.alpha.,6.beta.)-]
14307258	Lithium chromate
121755	Malathion
108-31-6	Maleic anhydride
592041	Mercuric cyanide
10045940	Mercuric nitrate
7783359	Mercuric sulfate
592858	Mercuric thiocyanate
7782867	Mercurous nitrate
7439-97-6	Mercury
72-43-5	Methoxychlor [Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4-methoxy-]
80-62-6	Methyl methacrylate
75865	2-Methyllactonitrile
3697243	5-Methylchrysene
298000	Methyl parathion
7786347	Mevinphos
300765	Naled
91-20-3	Naphthalene
7440-02-0	Nickel
15699180	Nickel ammonium sulfate
37211055	Nickel chloride
7718549	" "
12054487	Nickel hydroxide
14216752	Nickel nitrate
7786814	Nickel sulfate
7697-37-2	Nitric acid
98-95-3	Nitrobenzene
88-75-5	2-Nitrophenol
100-02-7	4-Nitrophenol
5522430	1-Nitropyrene
62-75-9	N-Nitrosodimethylamine
86-30-6	N-Nitrosodiphenylamine
621-64-7	N-Nitrosodi-n-propylamine
56-38-2	Parathion [Phosphorothioic acid, O,O-diethyl-O-(4-nitrophenyl) ester]
87-86-5	Pentachlorophenol (PCP)
85018	Phenanthrene
108-95-2	Phenol
7664-38-2	Phosphoric acid
7723-14-0	Phosphorus (yellow or white)
1336-36-3	Polychlorinated biphenyls (PCBs)
7784410	Potassium arsenate
10124502	Potassium arsenite
7778509	Potassium bichromate
7789006	Potassium chromate
151508	Potassium cyanide
2312358	Propargite
75-56-9	Propylene oxide
91-22-5	Quinoline
7782-49-2	Selenium
7446084	Selenium oxide
7440-22-4	Silver
7761888	Silver nitrate
7631892	Sodium arsenate
7784465	Sodium arsenite
10588019	Sodium bichromate
7775113	Sodium chromate
143339	Sodium cyanide

7632000	Sodium nitrite
10102188	Sodium selenite
7782823	" "
7789062	Strontium chromate
NA	Strychnine & salts
100-42-5	Styrene
7664-93-9	Sulfuric acid
79-34-5	1,1,2,2-Tetrachloroethane
127-18-4	Tetrachloroethylene (Perchloroethylene)
935-95-5	2,3,5,6-Tetrachlorophenol
78002	Tetraethyl lead
7440-28-0	Thallium
10031591	Thallium sulfate
108-88-3	Toluene
8001-35-2	Toxaphene
52-68-6	Trichlorfon [Phosphonic acid, (2,2,2-trichloro-1-hydroxyethyl)-dimethylester]
120-82-1	1,2,4-Trichlorobenzene
71-55-6	1,1,1-Trichloroethane (Methyl chloroform)
79-00-5	1,1,2-Trichloroethane
79-01-6	Trichloroethylene
95-95-4	2,4,5-Trichlorophenol
88-06-2	2,4,6-Trichlorophenol
121448	Triethylamine
7440-62-2	Vanadium (fume or dust)
108-05-4	Vinyl acetate
75-01-4	Vinyl chloride
75-35-4	Vinylidene chloride
108-38-3	m-Xylene
95-47-6	o-Xylene
106-42-3	p-Xylene
1330-20-7	Xylene (mixed isomers)
7440-66-6	Zinc (fume or dust)
557346	Zinc acetate
14639975	Zinc ammonium chloride
14639986	" " "
52628258	" " "
1332076	Zinc borate
7699458	Zinc bromide
3486359	Zinc carbonate
7646857	Zinc chloride
557211	Zinc cyanide
7783495	Zinc fluoride
557415	Zinc formate

STANDARD CONDITIONS

1. DEFINITIONS
   (a) 7 day average means the sum of the total daily discharges by mass, volume or concentration during a 7 consecutive day period, divided by the total number of days during the period that measurements were made. Four 7 consecutive day periods shall be used each month to calculate the 7-day average. The first 7-day period shall begin with the first day of the month.

   (b) 30 day average means the sum of the total daily discharges by mass, volume or concentration during a calendar month, divided by the total number of days during the month that measurements were made.

   (c) daily maximum means the total discharge by mass, volume or concentration during a twenty-four hour period.

2. DUTY TO COMPLY
   You must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. Issuance of this permit does not relieve you of the responsibility to comply with all local, state and federal laws, ordinances, regulations or other legal requirements applying to the operation of your facility.
   {See 40 CFR 122.41(a) and 567-64.3(11) IAC}

3. DUTY TO REAPPLY
   If you wish to continue to discharge after the expiration date of this permit you must file an application for reissuance at least 180 days prior to the expiration date of this permit.
   {See 567-64.8(1) IAC}

4. NEED TO HALT OR REDUCE ACTIVITY
   It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
   {See 567-64.7(5)(j) IAC}

5. DUTY TO MITIGATE
   You shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.
   {See 567-64.7(5)(i) IAC}

6. PROPERTY RIGHTS
   This permit does not convey any property rights of any sort or any exclusive privileges.

7. TRANSFER OF TITLE
   If title to your facility, or any part of it, is transferred the new owner shall be subject to this permit.
   {See 567-64.14 IAC}

   You are required to notify the new owner of the requirements of this permit in writing prior to any transfer of title. The Director shall be notified in writing within 30 days of the transfer

8. PROPER OPERATION AND MAINTENANCE

   All facilities and control systems shall be operated as efficiently as possible and maintained in good working order. A sufficient number of staff, adequately trained and knowledgeable in the operation of your facility shall be retained at all times and adequate laboratory controls and appropriate quality assurance procedures shall be provided to maintain compliance with the conditions of this permit.
   {See 40 CFR 122.41(e) and 567 64.7(5)(f) IAC}

9. DUTY TO PROVIDE INFORMATION
   You must furnish to the Director, within a reasonable time, any information the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. You must also furnish to the Director, upon request, copies of any records required to be kept by this permit.

10. MAINTENANCE OF RECORDS
    You are required to maintain records of your operation in accordance with 567-63.2 IAC.

11. PERMIT MODIFICATION, SUSPENSION OR REVOCATION
    (a) This permit may be modified, suspended, or revoked and reissued for cause including but not limited to those specified in 567-64.3(11) IAC.

    (b) This permit may be modified due to conditions or information on which this permit is based, including any new standard the department may adopt that would change the required effluent limits.
    {See 567-64.3(11)© IAC}

    (c) If a toxic pollutant is present in your discharge and more stringent standards for toxic pollutants are established under Section 307(a) of the Clean Water Act, this permit will be modified in accordance with the new standards.
    {See 567-64.7(5)(g) IAC}

    The filing of a request for a permit modification, revocation or suspension, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

12. SEVERABILITY
    The provisions of this permit are severable and if any provision or application of any provision to any circumstance is found to be invalid by this department or a court of law, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected by such finding.

STANDARD CONDITIONS

13. INSPECTION OF PREMISES, RECORDS, EQUIPMENT, METHODS AND DISCHARGES
You are required to permit authorized personnel to:

(a) Enter upon the premises where a regulated facility or activity is located or conducted or where records are kept under conditions of this permit.

(b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit.

(c) Inspect, at reasonable times, any facilities, equipment, practices or operations regulated or required under this permit.

(d) Sample or monitor, at reasonable times, for the purpose of assuring compliance or as otherwise authorized by the Clean Water Act.

14. TWENTY-FOUR HOUR REPORTING
You shall report any noncompliance that may endanger human health or the environment. Information shall be provided orally within 24 hours from the time you become aware of the circumstances. A written submission that includes a description of noncompliance and its cause; the period of noncompliance including exact dates and times, whether the noncompliance has been corrected or the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent a reoccurrence of the noncompliance must be provided within 5 days of the occurrence. The following instances of noncompliance must be reported within 24 hours of occurrence:

(a) Any unanticipated bypass which exceeds any effluent limitation in the permit.
{See 40 CFR 122.44(g)}

(b) Any upset which exceeds any effluent limitation in the permit.
{See 40 CFR 122.44(n)}

(c) Any violation of a maximum daily discharge limit for any of the pollutants listed by the Director in the permit to be reported within 24 hours.
{See 40 CFR 122.44(g)}

15. OTHER NONCOMPLIANCE
You shall report all instances of noncompliance not reported under Condition #14 at the time monitoring reports are submitted.

16. ADMINISTRATIVE RULES
Rules of this Department which govern the operation of your facility in connection with this permit are published in Part 567 of the Iowa Administrative Code (IAC) in Chapters 60-64 and 120-122. Reference to the term "rule" in this permit means the designated provision of Part 567 of the Iowa Administrative Code.

17. NOTICE OF CHANGED CONDITIONS
You are required to report any changes in existing conditions or information on which this permit is based:

(a) Facility expansions, production increases or process modifications which may result in new or increased discharges of pollutants must be reported to the Director in advance. If such discharges will exceed effluent limitations, your report must include an application for a new permit.
{See 567-64.7(5)(a) IAC}

(b) If any modification of, addition to, or construction of a disposal system is to be made, you must first obtain a written permit from this Department.
{See 567-64.2 IAC}

(c) If your facility is a publicly owned treatment works or otherwise may accept waste for treatment from industrial contributors see 567-64.3(5) IAC for further notice requirements.

(d) You shall notify the Director as soon as you know or have reason to believe that any activity has occurred or will occur which would result in the discharge of any toxic pollutant which is not limited in this permit.
{See 40 CFR 122.42(a)}

You must also notify the Director if you have begun or will begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant which was not reported in the permit application

18. OTHER INFORMATION
Where you become aware that you failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report, you must promptly submit such facts or information.

19. UPSET PROVISION

(a) Definition - "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

(b) Effect of an upset. An upset constitutes an affirmative defense in an action brought for noncompliance with such technology based permit effluent limitations if the requirements of paragraph *"c"* of this condition are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

(c) Conditions necessary for demonstration of an upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate through properly signed, contemporaneous operating logs, or other relevant evidence that;

(1) An upset occurred and that the permittee can identify the cause(s) of the upset.

(2) The permitted facility was at the time being properly operated; and

(3) The permittee submitted notice of the upset to the Department in accordance with 40 CFR 122.41(l)(6)(ii)(B).

(4) The permittee complied with any remedial measures required by Item #5 of the Standard Conditions of this permit.

(d) Burden of Proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

20. FAILURE TO SUBMIT FEES

This permit may be revoked, in whole or in part, if the appropriate permit fees are not submitted within thirty (30) days of the date of notification that such fees are due.

21. BYPASSES

(a) Definition - Bypass means the intentional diversion of waste streams from any portion of a treatment facility.

(b) Prohibition of bypass, Bypass is prohibited and the department may take enforcement action against a permittee for bypass unless:

(1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance;

(3) The permittee submitted notices as required by paragraph *"d"* of this section.

(c) The Director may approve an anticipated bypass after considering its adverse effects if the Director determines that it will meet the three conditions listed above.

(d) Reporting bypasses. Bypasses shall be reported in accordance with 567-63.6 IAC.

22. SIGNATORY REQUIREMENTS

Applications, reports or other information submitted to the Department in connection with this permit must be signed and certified as required by 567-64.3(8) IAC.

23. USE OF CERTIFIED LABORATORIES

Effective October 1, 1996, analyses of wastewater, groundwater or sewage sludge that are required to be submitted to the department as a result of this permit must be performed by a laboratory certified by the State of Iowa. Routine, on-site monitoring for pH, temperature, dissolved oxygen, total residual chlorine and other pollutants that must be analyzed immediately upon sample collection, settleable solids, physical measurements, and operational monitoring tests specified in 567-63.3(4) are excluded from this requirement.

APPENDIX D

REQUESTED INFORMATION

1) Responses to request for missing or additional information
2) HGM Levee/Dike Crest Elevation Profiles around South Ash Pond and North Ash Pond
3) Terracon Geotechnical Report

APPENDIX D

1) Responses to request for missing or additional information

From: Dodson, Kevin D [KDDodson@midamerican.com]
Sent: Thursday, October 21, 2010 10:35 AM
To: Tucker, Fred
Subject: Responses to Data Requests for Walter Scott Energy Center
Attachments: 112510_IMPOUNDMENT POND BERM 2of 2.pdf; 112510_IMPOUNDMENT POND BERM 1of 2.pdf

Mr. Tucker,

Outlined below are MidAmerican's responses to your data request questions for the surface impoundments at Walter Scott Energy Center.

Please let me know if you have any questions.

Thanks,
Kevin Dodson

WALTER SCOTT, JR ENERGY CENTER

1. There apparently are four "Underseepage Wells" located at the inside toe of the levee along Mosquito Creek near the southwest corner of the North Surface Impoundment. They apparently were original features that were relocated during construction of the dike for the North Surface Impoundment. They appear to be relief wells to relieve uplift pressure on inside slope and toe of the embankment during high water in Mosquito Creek. Is that their purpose or do they have some other purpose? Was there a blowout of the levee or incipient failure (possibly due to underseepage and excess uplift pressure) at one time that necessitated the installation of relief wells at that location?
    a. There are no known historical issues or failures in this area of the Levee . It is unknown what was the original purpose and design was of the under seepage relief wells. These wells were installed as part of original power plant levee construction design drawings in 1974 over 35 years ago.

2. The 1974 design plans show the top (crest) of the dike embankments, including the levees along Mosquito Creek and Pony Creek, at a uniform elevation of 980 feet. However, in the field the levee that encloses the south side of the north impoundment along Pony Creek appears to be 2 to 3 feet higher than the ash basin dike embankments along the east and north sides of the north impoundment and, though it is difficult to compare due to the presence of the railroad embankment, it appears that the levee along Pony Creek is higher than the levee along Mosquito Creek, too. On the south side of Pony Creek the levee that forms the north side of the South Surface Impoundment appears to be at about the same elevation as the levee on the north side of Pony Creek, but the top of the dike embankment on the east side of the south impoundment appears to be lower at some distance south of the north levee and "wavy" (up and down), then very low along the south part just before it intersects the south embankment, which is much higher and has a broad paved road on top. Thus, some of the embankment top elevations obviously are different than called for in original design. We would like to receive current (spot) elevations around the perimeters of both surface impoundments if possible, to get a better understanding of the tops of the embankments with respect to water and ash levels inside the impoundments. Elevations along the east embankment of the south impoundment are of particular interest. The profiles developed by Harza in 2008 appear to have used the 1974 design grades for the embankments, so those profiles do not provide the

information we seek. Unless we receive information to the contrary, our current interpretation of the embankment elevations is as follows.

North Surface Impoundment Embankment Top Elevations:
East, North, and West (Mosquito Creek) Sides = 980 ± feet
South (Pony Creek) Side = 982.5 ± feet
South Surface Impoundment Embankment Top Elevations:
East Side = 980 ± feet generally, 979 feet min (possibly lower)
North (Pony Creek) Side = 982.5 ± feet
South Side = 983 ± feet
West Side = 980 ± feet

Please note that these elevations generally do not jibe with the elevations, 983.3 feet for north impoundment and 983.0 feet for south impoundment, provided in descriptive information and given in answers to EPAs questionnaire in March 2009. Are those furnished elevations maximum elevations?

a. Previous reported EPA elevations were taken at spot locations along the Levee. The flood Levee along Pony Creek and Mosquito Creek are generally El 982+/-. The main power plant and surrounding adjacent Levees are generally built to El 981 +/- which corresponds to building datum of El 100. The height of the Levee varies per the Corp Project in 1980. A raise was made in the Levee by the Corp of Engineers and was sloped from El 982 to El 983 as part of Missouri River Levee System Project Unit L-611-614 in 1980. Enclosed are two survey drawings that Walter Scott Energy Center (WSEC) just completed which has entire perimeter spot elevations along stations shown for WSEC North Surface Impoundment Embankment Top Elevations and South Surface Impoundment Embankment Top Elevations.

3. When were the Pony Creek Levees raised?
   a. The Corp of Engineers changed the height of Mosquito Creek and Pony Creek Levees in the early 1980's. The Raise in Levee by Corp was sloped from El 982 to El 983 as part of Missouri River Levee System Project Unit L-611-614 in 1980.

4. We noticed that the discharge end of the outlet pipe (including last joint , end wall and flap gate) was detached and laying on the bank of Pony Creek. It apparently was damaged during the Corps of Engineers' dredging of Pony Creek. What is the status of getting the outlet structure repaired?
   a. The Corps of Engineers has indicated that in late October 2010, the Corp of Engineers/Missouri River Levee District work will begin on fixing various issues in this area including repair of the outlet structure which was damaged by their subcontractor during realignment of Pony Creek done earlier.

5. What is the top elevation of the slide gate (or stoplogs) at the inlet structure for the outlet at the north impoundment? A drawing for the inlet shows a future top elevation of 982' 10". Does MidAmerican envision that the inlet structure will ever be raised to that elevation, assuming beneficial use of ash materials will continue in the future?
   a. The top of stop logs and slide gate structure is currently El 970.55. At present there are no plans to raise the outlet structure but there is capability to do so to El 982' 10" on structure foundation drawings. The reason the structure has never been raised is the normal pond water elevation has historically always been below this level and there was no immediate need to have a tall structure. At this time WSEC does not plan to raise the

structure but has future capability to do so per original design drawings.

6. The south impoundment has no outlet and it is understood that the water is recycled to the plant for Unit 3 sluice water, which is discharged back into the impoundment. Recently there have been record wet conditions that have caused the water level in the pond to come within 2 feet of the low-point on the crest of the dike embankment on the east side. In case of future more extreme wet weather does MidAmerican have a way to take water out of the system to keep the water level at least 2 feet below the low point on the crest? If so, where is the water discharged? If not, how will MidAmerican prevent overtopping at the low point?
    a. MEC is monitoring the height of south pond on an ongoing basis and is currently curtailing the amount of plant excess water being discharged from the plant to the pond. There is currently more than 2 feet of freeboard at the south ash pond and freeboard is being maintained and gradually increasing. WSEC is using excess water in the pond for ash quenching and sluicing (recycling). WSEC would consider in an emergency situation, to acquire a permit amendment and divert some of water from the south pond to the north ash pond by portable pumps. WSEC does not expect to do so at this time with diminishing rainfall in fall months and the expected decrease of moisture in upcoming winter months.

7. Are the water levels that occurred during the recent wet weather considered the record water levels since the impoundments were put into operation? If not, what were the record water levels?
    a. Yes. Based on review of past documents and records, the South ash pond appears to be at a record water level with the record rainfall this year. It is unknown what the record water level was in north ash pond. In addition the USACE website shows the Missouri River water level at a record level at a location just a few miles north of site at the I-480 bridge with a recorded record river gage height on August 2, 2010 which was a new high over last 30 years.

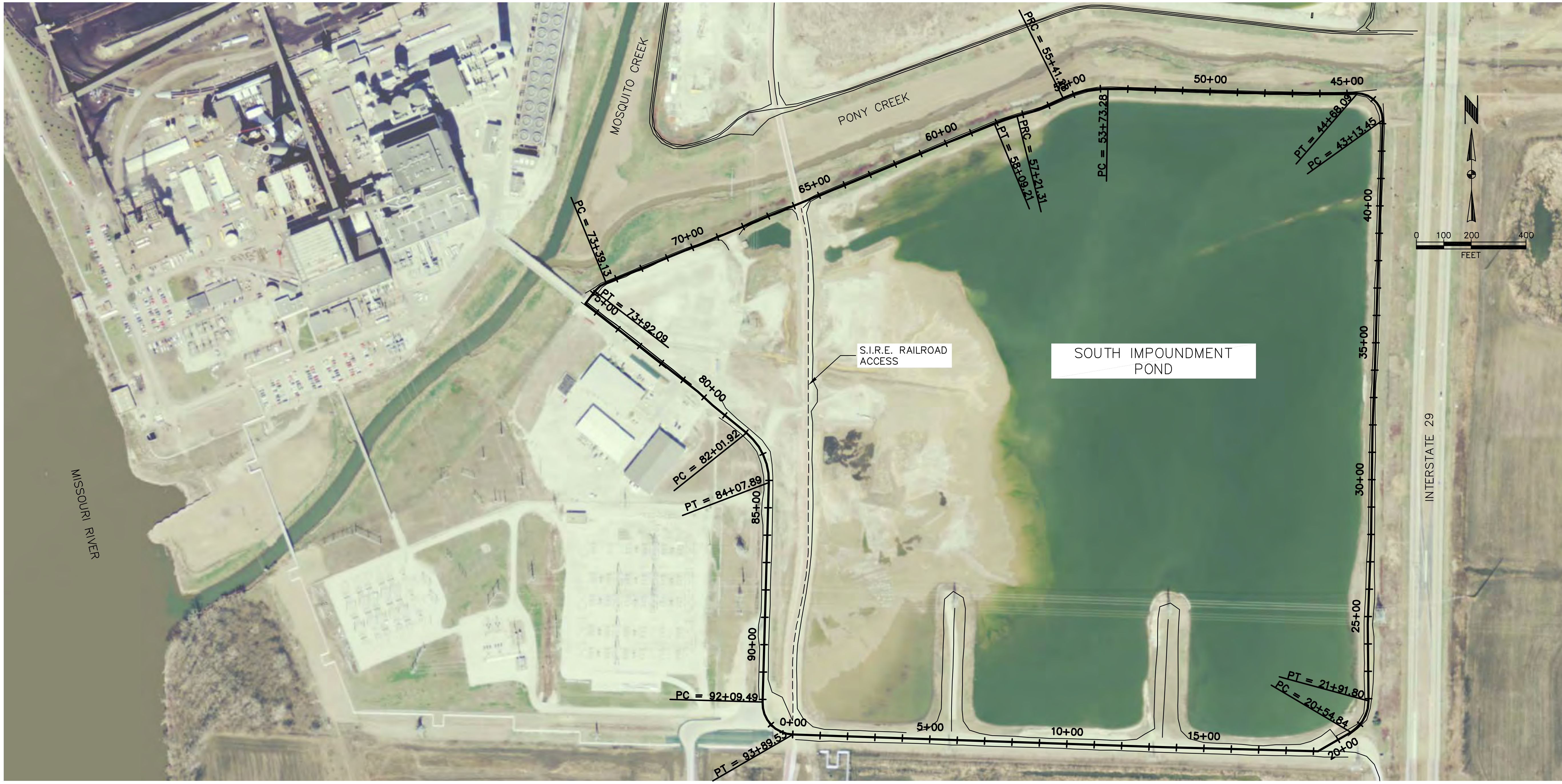
8. We seem to be having difficulty getting a copy of the Geotechnical Report prepared by Terracon. We have been directed to a lawyer who has stated that the report may not be released and would require a vote of the Trustees for the Levee District to determine whether it could be released. (Seems like such a report which presumably used public funds for public safety should be available as public record.) Our schedule of course does not allow time to wait for Trustees actions. Could MidAmerican get a copy of this report for us? The report is critical to our assessment, assuming it has information and stability analyses that directly pertain to the subject levee/dike embankments.
    a. The Levee District report you reference is in draft form, and the report is under further review by the District and Corp and has not been finalized by Levee District and therefore is not available for distribution. MEC is pursuing a separate geotechnical analyses for the surrounding WSEC ash pond levees which will be finalized very soon and will be provided under separate cover.

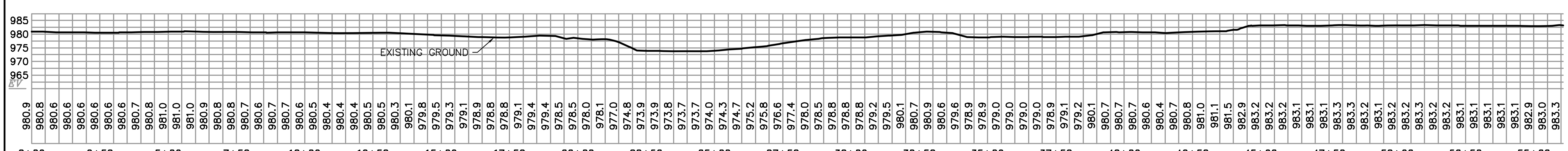
9. What are the maximum flood water levels that the levees have experienced since the time that the surface impoundments were put into operation?
    a. This year the current water level appears to be at a record level. USACE website shows at a location a few miles north on the Missouri River at the I-480 bridge to have recorded a record river gage height on August 2, 2010 which was new high over the last 30 years. Elevation of high river level at WSEC Unit 3's intake structure was approximately El 970 at this time on August 2, 2010.

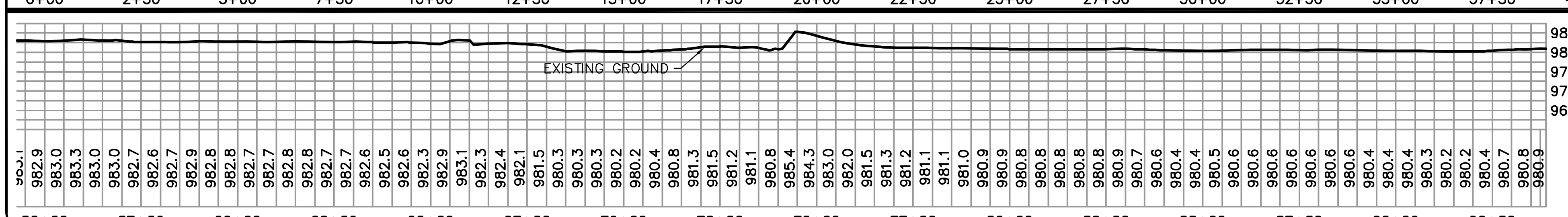
10. Is there a contingency plan for preventing or minimizing the loss of ash from the impoundments in case of overtopping breach or scour breach caused by floodwaters in Pony Creek or Mosquito Creek from floods approaching or exceeding the 100-year design flood for the levees?
    a. There is a very unlikely case of floodwaters exceeding the 100 year design flood level of the surrounding Creek's Levees into the ash ponds. This type of event is considered a very low risk. The design high water elevation based on the 100-year flood insurance study is EL 975.1, and the top of Levee is at El 982. MEC would work with local Corps of Engineers and Levee District to assist in emergency response to shore up Pony Creek and Mosquito Creek Levees in the case of such an unlikely event.

APPENDIX D

2) HGM Levee/Dike Crest Elevation Profiles around South Ash Pond and North Ash Pond







hgm
ASSOCIATES INC.
640 FIFTH AVENUE COUNCIL BLUFFS, IOWA
PHONE: (712) 323-0530

drawn	DEF
designed	DEF
approved	TLS
date	OCT '10
revision	
date	

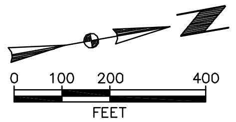
project: WSEC IMPOUNDMENT POND BERMS

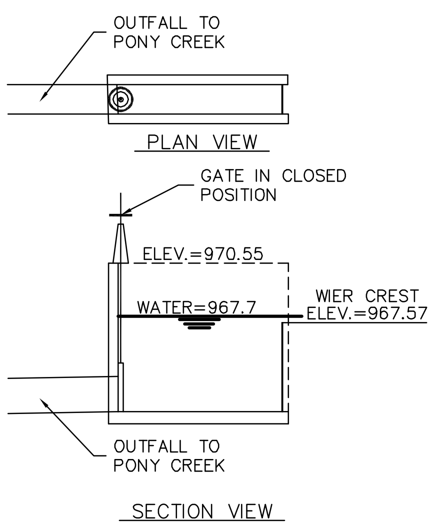
client: MIDAMERICAN ENERGY COMPANY
7215 NAVAJO ROAD, COUNCIL BLUFFS, IOWA

sheet: **SOUTH IMPOUNDMENT POND**

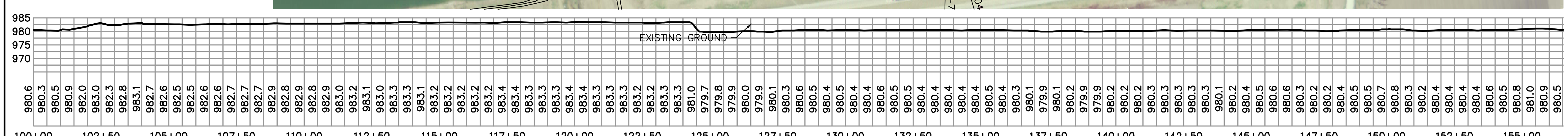
project no. 112510

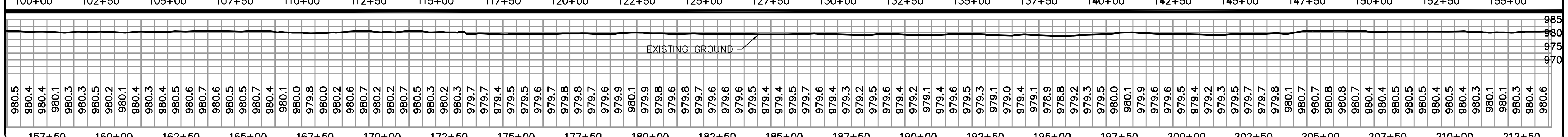
sheet **1 OF 2**





EXISTING OUTFALL STRUCTURE
N.T.S.





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drawn	DEF
designed	DEF
approved	TLS
date	OCT.'10
revision	
date	

project WSEC IMPOUNDMENT POND BERMS

client MIDAMERICAN ENERGY COMPANY
7215 NAVAJO ROAD, COUNCIL BLUFFS, IOWA

sheet **NORTH IMPOUNDMENT POND**

project no.
112510

APPENDIX D

3) Terracon Geotechnical Engineering Report

Geotechnical Engineering Report

Preliminary Opinions of Global Stability

Ash Containment Pond Embankments

Walter Scott Energy Center

Council Bluffs, Iowa

October 22, 2010

Terracon Project No. 05105087

Prepared for:

HGM Associates, Inc.
Council Bluffs, Iowa

Prepared by:

Terracon Consultants, Inc.
Omaha, Nebraska

LICENSED PROFESSIONAL ENGINEER EDWARD D. PROST, JR. 12790 IOWA	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa. Edward D. Prost Jr., P.E. 10-22-10 (date) My license renewal date is December 31, 2010. Pages or sheets covered by this seal: Geotechnical Engineering Report

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Terracon

October 22, 2010

HGM Associates, Inc
640 5th Avenue
Council Bluffs, Iowa 51502

Attention: Mr. Terry Smith, P.E.

Re: Geotechnical Engineering Report
Preliminary Opinions of Global Stability
Ash Containment Pond Embankments
Walter Scott Energy Center
Council Bluffs, Iowa
Terracon Project No. 05105087

Dear Mr. Smith:

Terracon Consultants, Inc. (Terracon) conducted a limited subsurface exploration to obtain data concerning subsurface conditions for our use in performing global stability analyses of selected Ash Containment Pond embankments as described in our Proposal P05090622. This report presents the findings of the subsurface exploration and provides the results of our slope stability analyses. The scope of exploration and analyses is considered limited and cursory and is not intended to meet any particular regulatory guidelines, but rather to provide preliminary opinions of global stability at selected locations.

We appreciate the opportunity to provide the geotechnical consulting services for this project and are prepared to provide more rigorous analyses as recommended in this report. Please contact us if you have any questions regarding this report.

Sincerely,

Terracon Consultants, Inc.

Michael D. Dingle

FOR Brett W. Larsen
Staff Geotechnical Engineer

Edward D. Prost, Jr., P.E.
Principal

BWL/EDP:bwl/leb

Report Distribution: Addressee (2, 1 via e-mail)
David Maystrick, MidAmerican Energy Company (1-via e-mail)

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Consultants to the EPA are currently conducting an audit of the ash containment ponds located on the east side of the Walter Scott Energy Center (WSEC) in Council Bluffs, Iowa. MidAmerican Energy Company (MEC) requested Terracon Consultants, Inc. (Terracon) conduct cursory analyses of global stability of the earth embankments that surround the ash ponds. Terracon understands this report will be provided to the EPA consultants to assist with their audit. Terracon conducted a limited subsurface exploration to obtain data concerning subsurface conditions for our use in performing the requested cursory global stability analyses of selected Ash Containment Pond embankments located at WSEC. Five borings, designated B-1, B-2, B-4, B-5, and B-6, were completed to depths of approximately 50 feet below the existing ground surface. To supplement data obtained from these borings, three electronic cone soundings, designated EC-1, EC-3 and EC-4 were completed to depths of approximately 19 to 47 feet. Boring and cone sounding locations are shown on the Location Diagram in Appendix A. Laboratory tests were performed on selected samples recovered from the borings.

This report presents the findings of the subsurface exploration and provides the results of our slope stability analyses. An abbreviated summary of findings, results, and recommendations are presented below. This report must be read in its entirety for a comprehensive understanding of our analyses and the limitations of this report.

For this study, embankment geometry was taken from survey cross sections supplied by HGM. The slope stability models utilized cohesion and friction angle values determined from experience with similar soils, correlation with data from index tests performed the samples recovered from borings, and shear strength test data obtained from discrete samples collected at the site during this and previous explorations. Two consolidated undrained triaxial tests were performed on samples obtained during this site exploration; sample 4 from Boring B-2 and sample 5 from Boring B-5. Strength parameters determined from the laboratory tests are representative of peak strengths. The design shear strength parameters selected for the embankment fill and native clay soils are representative of post-peak strengths, which consider the effects of long-term strain softening. Subsurface stratigraphy was based on conditions encountered at borings conducted along the crest of embankments. Piezometric surfaces were inferred based on elevations of static water surface levels in the ponds provided by HGM and short term water levels recorded at borings.

- Stability analyses were performed using the computer program SLOPE/W, developed by Geo-Slope Inc. Analyses searched for circular failure arcs on the upstream and downstream slope for the Steady Stage Seepage condition at the maximum pool elevations, which were set at 971.3 feet and 970 feet for the south and north ponds, respectively and the phreatic lines within the levees were estimated for each model. We also evaluated the seismic (pseudo-static) stability for the each model. The computer program utilized the Morgenstern-Price method to calculate the critical failure surfaces for each case. Four (4) cases were analyzed for each of six (6) models.

We did not analyze the selected models using undrained shear strength parameters. Undrained analyses are applicable to conditions that exist immediately following construction. Inasmuch as the embankments have been in place for some time and the embankments have not been recently altered, we did not consider undrained analyses would appropriately model current conditions. Also, since there is no mechanism to allow for rapid drawdown of the water levels within the ponds, we did not analyze the affect of rapid drawdown of pond water levels on the stability of slopes facing pond interiors.

- The stability analysis results were compared with US Army Corps of Engineers (USACE) minimum requirements for earthen levees contained in Table 6.1b from USACE EM 1110-2-1913. Models of the Embankment Sections A-A, C-C, E-E, F-F, L-L, M-M, and O-O were analyzed. Each of these models, representing sections in both the north and south pond, exhibit factors of safety greater than 1.4 for the steady state seepage conditions and greater than 1.0 for pseudo-static seismic conditions. The results are summarized in a table in Section 4.5 of this report.

- Since the time of our exploration, the owner reshaped portions of the pond side slope of the south levee to approximately 2 Horizontal: 1 Vertical by adding clay fill and surfacing with rip-rap at the water edge. This fill placement is anticipated to reduce further erosion action and in our opinion will not reduce the stability of the levee at these locations.

- Global stability of pond embankment slopes is sensitive to subsurface conditions, particularly at the base of the embankment slopes. Without boring data at the toes of the embankments, we extrapolated conditions encountered within the interior of the embankment to beyond the landward and pond side toe. Models do not reflect variations in stratigraphy or shear strength between or beyond the boring locations.

GEOTECHNICAL ENGINEERING REPORT
PRELIMINARY OPINIONS OF GLOBAL STABILITY
ASH CONTAINMENT POND EMBANKMENTS
WALTER SCOTT ENERGY CENTER
COUNCIL BLUFFS, IOWA

Terracon Project No. 05105087
October 22, 2010

1.0 INTRODUCTION

Consultants to the EPA are currently conducting an audit of the ash containment ponds located on the east side of the Walter Scott Energy Center (WSEC) in Council Bluffs, Iowa. MidAmerican Energy Company (MEC) requested Terracon Consultants, Inc. (Terracon) conduct cursory analyses of global stability of the earth embankments that surround the ash ponds. Terracon understands this report will be provided to the EPA consultants to assist with their audit. Terracon conducted a limited subsurface exploration to obtain data concerning subsurface conditions for our use in performing the requested cursory global stability analyses of selected Ash Containment Pond embankments located at WSEC. Five borings, designated B-1, B-2, B-4, B-5, and B-6, were completed to depths of approximately 50 feet below the existing ground surface. To supplement data obtained from these borings, three electronic cone soundings, designated EC-1, EC-3 and EC-4 were completed to depths of approximately 19 to 47 feet. Boring B-3 and cone sounding EC-2 were not completed due to the presence of overhead power lines along that portion of the embankment. Logs of the borings and cone penetrometer soundings along with a Location Diagram are included in Appendix A of this report.

This study was performed in general accordance with our proposal number P05100622 dated September 21, 2010.

2.0 PROJECT INFORMATION

2.1 Project Description

	Description
Background	Consultants to the EPA are currently conducting an audit of the ash containment ponds located on the east side of the Walter Scott Energy Center (WSEC) in Council Bluffs, Iowa. MidAmerican Energy Company (MEC) requested Terracon conduct cursory analyses of slope stability of the levees surrounding the ash ponds. MEC will provide our report to the EPA consultant.

	Description
Related Study	A study of the north levee of the south pond and analysis of the underseepage and slope stability was completed by Terracon and the results were presented to Olmsted and Perry Consulting Engineers (OPCE) in a report dated September 10, 2010 (Terracon Project No. 05095039). Additional borings were completed to install monitoring wells in the area of the containment ponds as part of a study conducted by MWH Consultants, Inc. The boring logs and location diagram for these borings is included in Appendix C and were utilized to supplement the subsurface information for the current study.
Limitations of this Study	Terracon performed a cursory evaluation of the slope stability of the existing levees surrounding the north and south ash containment ponds at the WSEC facility. Due to the limited scope of exploration and short time period allowed for these analyses, this study is not comprehensive, nor intended to meet any particular regulatory guidelines, but rather a preliminary study. No exploration or analysis was provided for the levees adjacent to Mosquito or Pony Creek, since these are in the USACE program. Opinions of global stability are based on simplified models developed as described in this report. Rigorous analyses of embankment stability would require performance of additional exploratory borings and laboratory tests, and analyses of underseepage.
Additional Information	Representatives of Terracon, HGM Associates, Inc. (HGM), and MEC selected and marked 13 locations along the pond levees on September 17, 2010 which appeared to include the more critical slope heights and grades for stability analysis. HGM provided survey cross-sections of the levees, extending into the pond area and beyond the toe on the opposite side from the pond. MEC indicated the following anticipated maximum water elevations for the ponds as follows: ■ North Pond: 970 feet ■ South Pond: 971.3 feet (current elevation assumed)

2.2 Site Location and Description

Item	Description
Location	The north and south ash containment ponds are located east of the WSEC in Council Bluffs, Iowa, between the WSEC and Interstate Highway 29.

Item	Description
Pond Descriptions	The north pond was utilized primarily for fly ash disposal and is currently being mined for hydrated fly ash and crushed to form a product marketed as “C-Stone”. The north pond is currently contained within an area along the east levee, extending to the north and south levees, with a large mass of hydrated fly ash separating the pond from the western portion of the containment area. The south pond was primarily used for containment of bottom ash and some process water. Bottom ash is currently being mined from this pond. The west levee of this containment area is embedded within a general fill area for a substation and some operations buildings, and is not considered a stability concern due to the wide area of containment. The pond currently borders the north, east, and south levees and is currently about 94.5 acres in size. A survey completed by OPCE indicated the elevation of the bottom of the south ash pond ranges from about 959.6 to 969.9 feet within about 100 feet of the Pony Creek levee toe, with the deeper bottom elevations to the east of about Station 984+00. The survey cross-sections completed by HGM indicate that the bottom elevation of the south pond typically ranges from about 960 to 965 feet. The bottom elevation of the north pond extends to about 953 feet near Pony Creek and is generally between 955 and 960 along the east levee.
Pond Water Surface Elevations	Water levels were recorded by HGM on September 11, 2010 as follows: ■ North Pond: 967.8 feet ■ South Pond: 971.3 feet ■ Pony Creek (location between ponds): 963.1 feet
Existing Levees	The ponds are surrounded by levees (earth embankments) on all sides. The north and south ponds are separated by an east-west flowing section of Pony Creek. The levees separating the ponds from Pony Creek are USACE designed levees, maintained by the M & P Levee Improvement District. The north pond area is bordered on the west side by a levee along Mosquito Creek, which is also a USACE levee, maintained by the City of Council Bluffs. The remainder of the surrounding levees are maintained by MEC and were reportedly designed by Black and Veatch. The levee crest along Pony Creek is about Elevation 982 to 983 feet along the ponds. The levee crest along Mosquito Creek is about Elevation 979 to 981 feet where it borders the ponds. The

Item	Description
	elevation of the ash pond levees not bordering the creeks varies. A low area of levee embankment is present along the east levee, near the southeast corner of the south pond and was recorded by HGM to be about Elevation 973.2 feet. The remainder of the levee crest generally ranges from about Elevation 979 to 981 feet. The following information was obtained from the plans for the levee system, prepared by the USACE dated March 1980. The levee sections bordering Pony Creek were designed with 3 horizontal to 1 vertical slopes and contain random fill material within the core of the levee with lower permeability soils along the faces of the levee (3 feet thick creek side, 1 foot thick land or ash pond side). Plans dated January 21, 1974, provided by MEC and prepared by Black and Veatch indicate that the other pond levees were also constructed with 3 horizontal to 1 vertical side slopes, and included the initial construction of the embankment along the south side of Pony Creek to a crest elevation of about 980 feet.

3.0 SUBSURFACE CONDITIONS

3.1 Mapped Soil Units

The project site is located in Pottawattamie County Iowa. The Soil Survey of Pottawattamie County, Iowa, indicates the primary soil type at the project site is the Albaton Silty Clay soil unit. The following table summarizes the major soil unit identified in the Soil Survey.

Soil Name	Parent Material	Drainage Class	Flooding Frequency	Depth to Seasonal High Water Table
Albaton Silty Clay	Clayey alluvium	Poorly drained	Occasional	About 0 to 12 inches

3.2 Typical Profile

Borings and cone penetrometer soundings were conducted from the levee crest. Subsurface conditions encountered at the borings are described as follows:

Description	Approximate Depth to Bottom of Stratum	Material Encountered	Consistency/Density
Surface:	N/A	Grass and a shallow root zone	N/A

Description	Approximate Depth to Bottom of Stratum	Material Encountered	Consistency/Density
Stratum 1 (Embankment Fill)	8 to 13 feet	Fat Clay with pockets of Lean Clay and Silty Fine Sand	N/A
Stratum 2 (Alluvium)	33.5 feet at Boring 1 >50 feet at Boring 2 17.5 to 19.5 feet at Borings 4, 5, and 6	Fat Clay	Stiff to Very Stiff
Stratum 3 (Alluvium)	Underlying Stratum 2 (except at Boring 2) to their completed depths	Fine Sand, Silty Fine Sand	Loose to Dense

Since samples are not recovered using the cone, stratigraphy is correlated to cone penetration data. These data inferred conditions similar to those encountered at nearby borings. We inferred primarily cohesive soils are present to depths of about 16 feet at EC-2 and EC-3, and to a depth of about 47 feet at EC-1. The cohesive soils were underlain by granular soils. Conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in situ, the transition between materials may be gradual. The boring logs and cone soundings are in Appendix A.

3.3 Groundwater Conditions

The boreholes were observed while drilling for the presence and level of groundwater. The water levels observed are noted on the attached boring logs, and are summarized below.

Boring Number	Depth to groundwater while drilling, ft.
B-1	N/R[1]
B-2	N/R[1]
B-4	N/R[1]
B-5	17.5
B-6	18

1. Water levels not recorded (N/R) below 10 feet because wash bore methods were used to advance borings.

The levels of naturally occurring groundwater could not be determined following drilling where water or drilling slurry had been used to advance the boreholes. We grouted the boreholes after drilling. A relatively long period of time is necessary for a groundwater level to develop and stabilize in a borehole. Longer term monitoring in cased holes or piezometers would be required for a more accurate evaluation of the groundwater conditions.

Fluctuations of the water levels will occur due to fluctuations in the water level of the Missouri River, Mosquito and Pony Creeks, the ash ponds, seasonal variations in the amount of rainfall and runoff, and other factors not evident at the time the borings were performed. Subsurface water levels during construction or at other times in the life of the structure will be higher or lower than the levels indicated in the boring logs. Perched water conditions can also develop overlying clay layers. The possibility of groundwater level fluctuations and development of perched water conditions should be considered when developing the design and construction plans for the project.

4.0 GLOBAL STABILITY OF ASH POND EMBANKMENTS

4.1 Mechanics of Slope Stability

As used in slope stability analyses, *Factor of Safety* is considered to be the sum of resisting forces (those forces which resist movement) divided by the sum of driving forces (those forces which promote movement). Therefore, for a slope to be stable, the resisting forces must be greater than the driving forces and their ratio, or Factor of Safety, must be greater than 1. The acceptable factor of safety for any particular slope depends upon many factors. Consequences of slope failure are one factor. The extent to which subsurface material properties, piezometric pressures, and geometry are precisely known is another very important factor.

Analyses techniques are based on principles of mechanics. Input parameters include slope geometry, material strength, presence and orientation of discrete subsurface layers and water (piezometric) pressure.

For this study, slope geometry was taken from survey cross sections supplied by HGM, material strength properties were inferred from available laboratory test data obtained by testing samples obtained from the limited number of exploratory borings, correlations with index properties and our experience with similar soils in the area. The estimated strength parameters are effective stress parameters. Subsurface geometry was based on conditions encountered at borings conducted along the crest of embankments. Piezometric surfaces were inferred based on elevations of static water surface levels in the ponds provided by HGM and short term water levels recorded at borings.

4.2 Selection of Embankment Sections for Analysis

Survey cross sections of the existing embankments at distinct locations were provided by HGM. Terracon selected seven (7) of the provided cross sections for slope stability analyses of the levees of the north and south ponds. Four sections at the south pond (A-A, C-C, E-E, and F-F) and three sections at north pond (L-L, M-M, and O-O) were modeled. The maximum water surface elevations were considered as 971.3 feet and 970 feet for the south and north ponds, respectively. These elevations were indicated by MEC to represent the highest anticipated water elevations which would be allowed to occur within these ponds. The effective stress shear strength parameters selected for the analyses are representative of post-peak strengths which consider the effects of long-term strain softening.

We did not analyze the selected models using undrained shear strength parameters. Undrained analyses are applicable to conditions that exist immediately following construction. Inasmuch as the embankments have been in place for some time and the embankments have not been recently altered, we did not consider undrained analyses would appropriately model current conditions. Also, since there is no mechanism to allow for rapid drawdown of the water levels within the ponds, we did not analyze the affect of rapid drawdown of pond water levels on the stability of slopes facing pond interiors.

4.3 Subsurface Profile and Shear Strength Parameters

Data obtained from our exploratory borings, cone soundings, the topographical survey of the site, and laboratory tests, were used to constitute the slope models for performing global stability analyses of the existing embankments.

Borings and cone soundings were performed at the crest of the levees. Explorations were not performed in the area of proposed Boring B-2 and Cone Sounding EC-2, which was not accessible to our drilling equipment due to overhead power lines. The subsurface profiles for the analysis models were interpreted and extrapolated from the nearest boring or cone sounding. Since borings were only performed at the crest of the existing levees and no information was available regarding the conditions at the toe of the embankments, we considered that stratum elevations encountered at the borings or cone soundings represented a relatively level contact between strata.

The slope stability analyses utilized cohesion and friction angle values determined from experience with similar soils, correlation with data from index tests performed the samples recovered from borings, and shear strength test data obtained from discrete samples collected at the site during this and previous explorations. Two consolidated undrained triaxial tests were performed on samples from this site exploration; one on Sample 4 of Boring B-2 and one on sample 5 of Boring B-5. Refer to appendix B. Strength parameters determined from the laboratory testing are representative of peak strengths. The design shear strength parameters selected for the embankment fill and native clay soils are representative of post-peak strengths, which consider the effects of long-term strain softening. The effective friction angle for the native sand deposits was taken as 29 degrees, based on the correlated value range of 28 to 30 degrees published in NAVFAC DM-7 for silty sand. The shear strength parameters used in our analyses are summarized below:

Material	Total Unit Weight (pcf)	Effective Stress Friction Angle (degrees)	Effective Stress Cohesion (psf)
Embankment Fill	120	26	50
Fat Clay Foundation Soils	120	26 [1]	50
Silty Sand	125	29	0

1. Effective stress friction angles as low as 20 degrees were used in models for soft and very soft clay layers encountered below approximate elevation 950 feet.

4.4 Earthquake Parameters for Seismic Analyses

Based on 2008 USGS Earthquake Hazard Maps, the peak ground acceleration with a 2% probability of exceedance in 50 years at the project site is 0.0455 g. The pseudo static analyses were performed at 2/3 of the design acceleration ground acceleration. A horizontal seismic coefficient of 0.0428 and a vertical seismic coefficient of zero were used in our analyses.

4.5 Results of Analyses

Stability analyses were performed using the computer program SLOPE/W, developed by Geo-Slope Inc. Analyses searched for circular failure arcs on the upstream and downstream slope for the Steady Stage Seepage condition at the maximum pool elevations, which were set at 971.3 feet and 970 feet for the south and north ponds, respectively and the phreatic lines within the levees were estimated for each model. We also evaluated the seismic (pseudo-static) stability for the each model. The computer program utilized the Morgenstern-Price method to calculate the failure surfaces for each case. Four (4) cases were analyzed for each of six (6) models. The following table summarizes factors of safety determined for each case.

		Factor of Safety Obtained from Analysis [1]					
		Steady State Seepage			Seismic (pseudo-static)		
Pond	Section[2]	Required Minimum Factor of Safety [3]	Upstream	Downstream	Required Minimum Factor of Safety [3]	Upstream	Downstream
South	A-A	1.4	1.73	1.79	1.0	1.52	1.57
	C-C	1.4	1.50	1.82	1.0	1.39	1.60
	E-E	1.4	4.05	2.20	1.0	2.42	1.82
	F-F	1.4	1.66	1.64	1.0	1.45	1.44
North	L-L	1.4	1.70	1.61	1.0	1.50	1.40
	M-M	1.4	1.74	1.87	1.0	1.49	1.60
	O-O	1.4	1.57	1.64	1.0	1.39	1.46

		Factor of Safety Obtained from Analysis [1]					
		Steady State Seepage			Seismic (pseudo-static)		
Pond	**Section[2]**	**Required Minimum Factor of Safety [3]**	**Upstream**	**Downstream**	**Required Minimum Factor of Safety [3]**	**Upstream**	**Downstream**

1. Reported factors of safety are for deep seated circular "failure" surfaces that emerge near the levee crest. Computed factors of safety for shallow circular "failure" surfaces near the toe of the levee may be smaller.
2. Refer to Ash Pond Plan in Exhibit D-1, for cross section locations.
3. Reference: Table 6.1b from EM 1110-2-1913

Based on these analyses, Models of the Embankment Sections (A-A, C-C, E-E, F-F, L-L, M-M, and O-O) exhibit factors of safety greater than 1.4 for the steady state seepage conditions and greater than 1.0 for pseudo-static seismic conditions. Graphical results of the slope stability analyses for all cases are in Appendix D.

Since the time of our exploration, the owner reshaped portions of the pond side slope of the south levee to approximately 2 Horizontal:1 Vertical by adding clay fill and surfacing with rip-rap at the water edge. This fill placement is anticipated to reduce further erosion action and in our opinion will not reduce the stability of the levee at these locations.

The global stability of pond embankment slopes is sensitive to subsurface conditions, particularly at the base of the embankment slopes. Without boring data at the toes of the embankments, we extrapolated conditions encountered within the interior of the embankment to beyond the landward and pond side toe. Our models do not reflect variations in stratigraphy or shear strength between or beyond the boring locations.

5.0 GENERAL COMMENTS

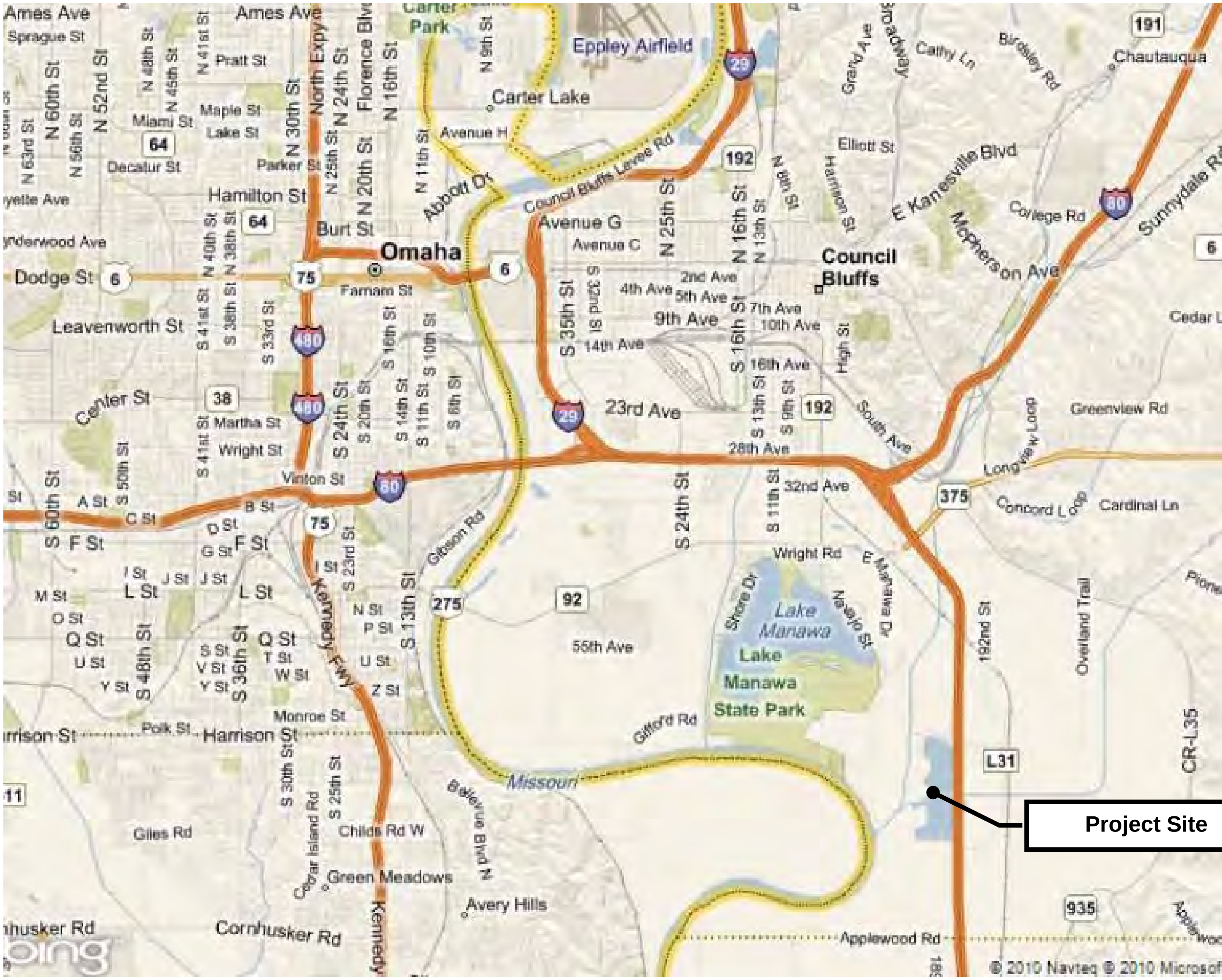
The limited, cursory global stability analyses presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. The models for global stability analysis were developed using survey data provided by others. Subsurface stratigraphy for each model was extrapolated from nearby borings; actual conditions may be different and such differences would affect the results of our analyses. More rigorous analyses would require more exploration and laboratory tests and analyses of underseepage. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that the actual embankment conditions are found to vary from the analyses models described in this report, the analyses and opinions expressed herein shall not be considered valid unless Terracon reviews the actual conditions and further verifies the analyses and opinions of this report in writing.

APPENDIX A

FIELD EXPLORATION



N

Project Manager: EDP	Project No. 05105087	**Terracon** Consulting Engineers & Scientists 15080 A Circle Omaha, Nebraska 68144 PH. (402) 330-2202 FAX. (402) 330-7606	VICINITY MAP WSEC ASH CONTAINMENT PONDS 7215 NAVAJO STREET COUNCIL BLUFFS, IOWA
Drawn by: EDP	Scale: N.T.S.		
Checked by: CKD	File Name: 05105087 VMAP		
Approved by: CKD	Date: 10/6/2010		Ex. No. A-1

Note: Boring 3 and Cone Sounding EC-2 were not completed due to overhead power line obstruction.

N

- Boring location
- Cone sounding location

Source: HGM Associates, Inc. Exhibit on Aerial

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager: EDP	Project No. 05105087	Terracon Consulting Engineers & Scientists	BORING LOCATION DIAGRAM	FIG No.
Drawn by: EDP	Scale: As Shown	15080 A Circle Omaha, Nebraska 68144	WSEC ASH CONTAINMENT PONDS	A-2
Checked by:	File Name: 05105087BLAN	PH. (402) 330-2202 FAX. (402) 330-7606	7215 NAVAJO STREET	
Approved by: EDP	Date: 10/6/2010		COUNCIL BLUFFS, IOWA	

LOG OF BORING NO. B-1

CLIENT
HGM Associates Inc.

SITE **WSEC, 7215 Navajo Road**
Council Bluffs, IA

PROJECT
WSEC Ash Containment Ponds

Approx. Surface Elev.: 980 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft.	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Atterberg Limits, %
(FILL) FAT CLAY Dark gray				HS						
			1	ST	7		30	90	6000*	
			2	ST	11		29 13	89	6000*	LL = 62 PL = 22 PI = 40
With clayey sand seam at about 4.5 feet	5		3	ST	15				6000*	
				HS						
8 — 972										
FAT CLAY Dark gray and gray Very stiff		CH	4	ST	14		32	88	6500* 3060	
	10			WB						
		CH	5	SS	15	10	37		4500*	
	15			WB						
Medium stiff below about 18.5 feet		CH	6	SS	18	4	36		2000*	
	20			WB						
		CH	7	SS	18	WOH	46		2000*	LL = 70 PL = 23 PI = 47
	25			WB						
Very soft at about 28.5 feet		CH	8	SS	18	WOH	53		<500*	
	30			WB						

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME Automatic Hammer

WATER LEVEL OBSERVATIONS, ft		
WL	N/E	WD
WL		
WL		

Terracon

BORING STARTED	9-24-10
BORING COMPLETED	9-24-10
RIG 958	FOREMAN MR
APPROVED EDP	JOB # 05105087

BOREHOLE 05105087 LOGS.GPJ TERRACON.GDT 10/4/10

LOG OF BORING NO. B-1

CLIENT: **HGM Associates Inc.**

SITE: **WSEC, 7215 Navajo Road**
Council Bluffs, IA

PROJECT: **WSEC Ash Containment Ponds**

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft.	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Atterberg Limits, %
	33.5 — 946.5										
	SILTY FINE SAND Gray Medium dense		SM	9	SS	12	14	26			
		35			WB						
			SM	10	SS	10	10	20			
		40			WB						
	Dense at about 43.5 feet		SM	11	SS	12	33	24			
		45			WB						
			SM	12	SS	12	29	25			
	50 — 930	50									
	BOTTOM OF BORING										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME Automatic Hammer

WATER LEVEL OBSERVATIONS, ft		
WL	∇ N/E	WD ▼
WL	▼	▼
WL		

Terracon

BORING STARTED	9-24-10
BORING COMPLETED	9-24-10
RIG 958	FOREMAN MR
APPROVED EDP	JOB # 05105087

LOG OF BORING NO. B-2

CLIENT: **HGM Associates Inc.**

SITE: **WSEC, 7215 Navajo Road, Council Bluffs, IA**

PROJECT: **WSEC Ash Containment Ponds**

Approx. Surface Elev.: 974 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N ** BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: DRY UNIT WT pcf	TESTS: UNCONFINED STRENGTH, psf	TESTS: Atterberg Limits, %
	(FILL) FAT CLAY Dark gray and gray				HS						
				1	ST	13		30	88	5000*	
				2	ST	9		30	92	7500*	
		5		3	ST	14		30	90	5500*	
					HS						
				4	ST	18				4500*	
	10 — 964	10									
	FAT CLAY Dark gray Stiff				WB						
			CH	5	ST	20		35	84	3000* 1240 UU	LL = 58 PL = 24 PI = 34
		15			WB						
			CH	6	ST	17		40	79	2500*	
		20			WB						
	Very soft below about 23.5 feet		CH	7	SS	18	WOH	65		<500*	
		25			WB						
			CH	8	SS	18	WOH	72		<500*	
		30			WB						

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME Automatic Hammer

WATER LEVEL OBSERVATIONS, ft				
WL	▽ N/E	WD ▼		
WL	▼	▼		
WL				

BORING STARTED	9-24-10		
BORING COMPLETED	9-24-10		
RIG	958	FOREMAN	MR
APPROVED	EDP	JOB #	05105087

Terracon

LOG OF BORING NO. B-2

CLIENT **HGM Associates Inc.**

SITE **WSEC, 7215 Navajo Road Council Bluffs, IA**

PROJECT **WSEC Ash Containment Ponds**

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft.	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Atterberg Limits, %
FAT CLAY Dark gray Very soft		CH	9	SS	18	WOH	60		<500*	LL = 86 PL = 26 PI = 60
	35			WB						
		CH	10	SS	15	WOH	66		<500*	
	40			WB						
		CH	11	SS	18	WOH	66		<500*	LL = 80 PI = 26 Pi = 54
	45			WB						
Soft at about 48.5 feet		CH	12	SS	12	2	61			
50 — 924	50									
BOTTOM OF BORING										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME Automatic Hammer

WATER LEVEL OBSERVATIONS, ft			
WL	N/E	WD	
WL			
WL			

Terracon

BORING STARTED	9-24-10
BORING COMPLETED	9-24-10
RIG 958	FOREMAN MR
APPROVED EDP	JOB # 05105087

BOREHOLE 05105087 LOGS.GPJ TERRACON.GDT 10/4/10

LOG OF BORING NO. B-4

CLIENT **HGM Associates Inc.**

SITE **WSEC, 7215 Navajo Road, Council Bluffs, IA**

PROJECT **WSEC Ash Containment Ponds**

Approx. Surface Elev.: 980 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Atterberg Limits, %
(FILL) FAT CLAY Dark gray (blocky with trace roots)				HS						
			1	ST	19		25	87	9000+*	LL = 66 PL = 25 PI = 41
			2	ST	6		22	101	9000+*	
	5		3	ST	15		26	93	8500*	
				HS						
			4	ST	20		16	105	2650 UU	LL = 30 PL = 13 PI = 17
	10			WB						
13 — 967										
FAT CLAY Dark gray Stiff to very stiff		CH	5	SS	15	10	28			
	15			WB						
19.5 — 960.5		CH	6	SS	18	22	32			LL = 29 PL = 15 PI = 14
SILTY FINE SAND Gray Medium dense	20			WB						
		SM	7	SS	12	21	24			
	25			WB						
		SM	8	SS	10	15	24			
	30			WB						

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME Automatic Hammer

WATER LEVEL OBSERVATIONS, ft		
WL	▽ N/E	WD ▼
WL	▼	▼
WL		

Terracon

BORING STARTED	9-24-10		
BORING COMPLETED	9-24-10		
RIG	958	FOREMAN	MR
APPROVED	EDP	JOB #	05105087

BOREHOLE 05105087 LOGS.GPJ TERRACON.GDT 10/4/10

LOG OF BORING NO. B-4

CLIENT
HGM Associates Inc.

SITE **WSEC, 7215 Navajo Road**
Council Bluffs, IA

PROJECT
WSEC Ash Containment Ponds

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft.	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Atterberg Limits, %
SILTY FINE SAND Gray Medium dense		SM	9	SS	12	13	27			
	35			WB						
		SM	10	SS	12	16	22			
	40			WB						
Dense at about 43.5 feet		SM	11	SS	15	31	24			
	45			WB						
		SM	12	SS	15	19	25			
50 930	50									
BOTTOM OF BORING										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME Automatic Hammer

WATER LEVEL OBSERVATIONS, ft		
WL	N/E	WD
WL		
WL		

Terracon

BORING STARTED	9-24-10
BORING COMPLETED	9-24-10
RIG 958	FOREMAN MR
APPROVED EDP	JOB # 05105087

BOREHOLE 05105087 LOGS.GPJ TERRACON.GDT 10/4/10

LOG OF BORING NO. B-5

CLIENT	
HGM Associates Inc.	
SITE: WSEC, 7215 Navajo Road, Council Bluffs, IA	PROJECT: WSEC Ash Containment Ponds

DESCRIPTION (Approx. Surface Elev.: 980.5 ft)	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft.	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Atterberg Limits, %
(FILL) FAT CLAY with sand seams Dark grayish brown				HS						
			1	ST	12		24	93	7000*	
			2	ST	10		19	106	6000*	
	5		3	ST	9		26	94	5000*	LL = 49 PL = 18 PI = 31
				HS						
			4	ST	12		28	96	4130 UU	LL = 52 PL = 21 PI = 31
	10			HS						
13 — 967.5										
FAT CLAY Dark gray		CH	5	ST	18					
	15			HS						
17.5 — ▽ — 963										
SILTY FINE SAND Gray		SM	6	ST	21		25			
	20			WB						
Medium dense below about 23.5 feet		SM	7	SS	18	26	25			
	25			WB						
		SM	8	SS	12	25	25			
	30			WB						

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME Automatic Hammer

WATER LEVEL OBSERVATIONS, ft					
WL	▽ 17.5	WD ▼		BORING STARTED	9-24-10
WL	▼	▼		BORING COMPLETED	9-24-10
WL				RIG 102 / FOREMAN SP	
				APPROVED EDP / JOB # 05105087	

Terracon

Exhibit A-9

BOREHOLE 05105087 LOGS.GPJ TERRACON.GDT 10/4/10

LOG OF BORING NO. B-5

CLIENT
HGM Associates Inc.

SITE **WSEC, 7215 Navajo Road**
Council Bluffs, IA

PROJECT
WSEC Ash Containment Ponds

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft.	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Atterberg Limits, %
	SILTY FINE SAND Gray Loose		SM	9	SS	18	8	26			
		35			WB						
			SM	10	SS	12	11	24			
		40			WB						
	Dense at about 43.5 feet		SM	11	SS	18	34	23			
		45			WB						
	Medium dense at about 48.5 feet		SM	12	SS	12	27	8			
50	930.5	50									
	BOTTOM OF BORING										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME Automatic Hammer

WATER LEVEL OBSERVATIONS, ft		
WL	∇ 17.5 WD	▼
WL	▼	▼
WL		

Terracon

BORING STARTED	9-24-10
BORING COMPLETED	9-24-10
RIG 102	FOREMAN SP
APPROVED EDP	JOB # 05105087

BOREHOLE 05105087 LOGS.GPJ TERRACON.GDT 10/4/10

LOG OF BORING NO. B-6

CLIENT HGM Associates Inc.	
SITE WSEC, 7215 Navajo Road Council Bluffs, IA	PROJECT WSEC Ash Containment Ponds

Approx. Surface Elev.: 980.5 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N ** BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: DRY UNIT WT pcf	TESTS: UNCONFINED STRENGTH, psf	TESTS: Atterberg Limits, %
(FILL) FAT CLAY Dark gray With trace calcareous between 1 to 3 feet				HS						LL = 61 PL = 24 PI = 37
			1	ST	10		32	77	3500*	
			2	ST	13		26	91	7000*	LL = 59 PL = 23 PI = 36
	5		3	ST	NR					
				HS						
			4	ST	9		33	87	6000*	
	10			HS						
13 — 967.5										
SANDY FAT CLAY Dark grayish brown		CH	5	ST	6		26			LL = 55 PI = 23 PI = 32
	15			HS						
18.5 — ▽ — 962										
SILTY FINE SAND Gray Loose		SM	6	SS	18	7	23			
	20			WB						
Medium dense below about 23.5 feet		SM	7	SS	12	27	22			
	25			WB						
		SM	8	SS	12	14	28			
	30			WB						

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME Automatic Hammer

WATER LEVEL OBSERVATIONS, ft		
WL	▽ 18	WD ▼
WL	▼	▼
WL		

Terracon

BORING STARTED			9-24-10
BORING COMPLETED			9-24-10
RIG	102	FOREMAN	SP
APPROVED	EDP	JOB #	05105087

BOREHOLE 05105087 LOGS.GPJ TERRACON.GDT 10/4/10

LOG OF BORING NO. B-6

CLIENT
HGM Associates Inc.

SITE **WSEC, 7215 Navajo Road**
Council Bluffs, IA

PROJECT
WSEC Ash Containment Ponds

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N ** BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: DRY UNIT WT pcf	TESTS: UNCONFINED STRENGTH, psf	Atterberg Limits, %
	SILTY FINE SAND Gray Medium dense		SM	9	SS	12	11				
		35			WB						
	Loose, with decayed wood fragments at about 38.5 feet		SM	10	SS	12	6	36			
		40			WB						
			SM	11	SS	18	16	28			
		45			WB						
	Dense at about 48.5 feet		SM	12	SS	18	38	24			
	50 — 930.5	50									
	BOTTOM OF BORING										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

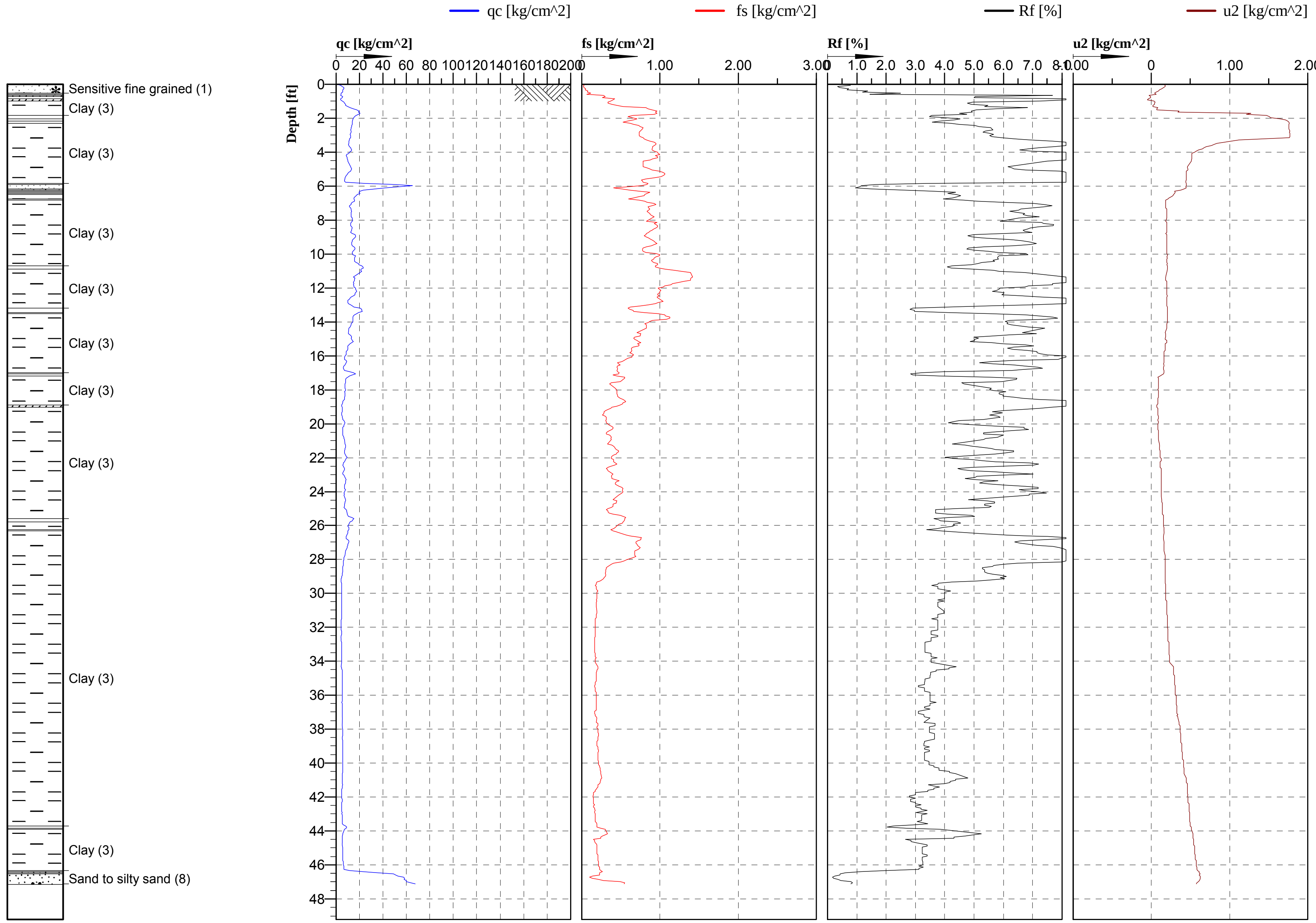
*Calibrated Hand Penetrometer
**CME Automatic Hammer

WATER LEVEL OBSERVATIONS, ft		
WL	18	WD
WL		
WL		

Terracon

BORING STARTED			9-24-10
BORING COMPLETED			9-24-10
RIG	102	FOREMAN	SP
APPROVED	EDP	JOB #	05105087

BOREHOLE 05105087 LOGS.GPJ TERRACON.GDT 10/4/10



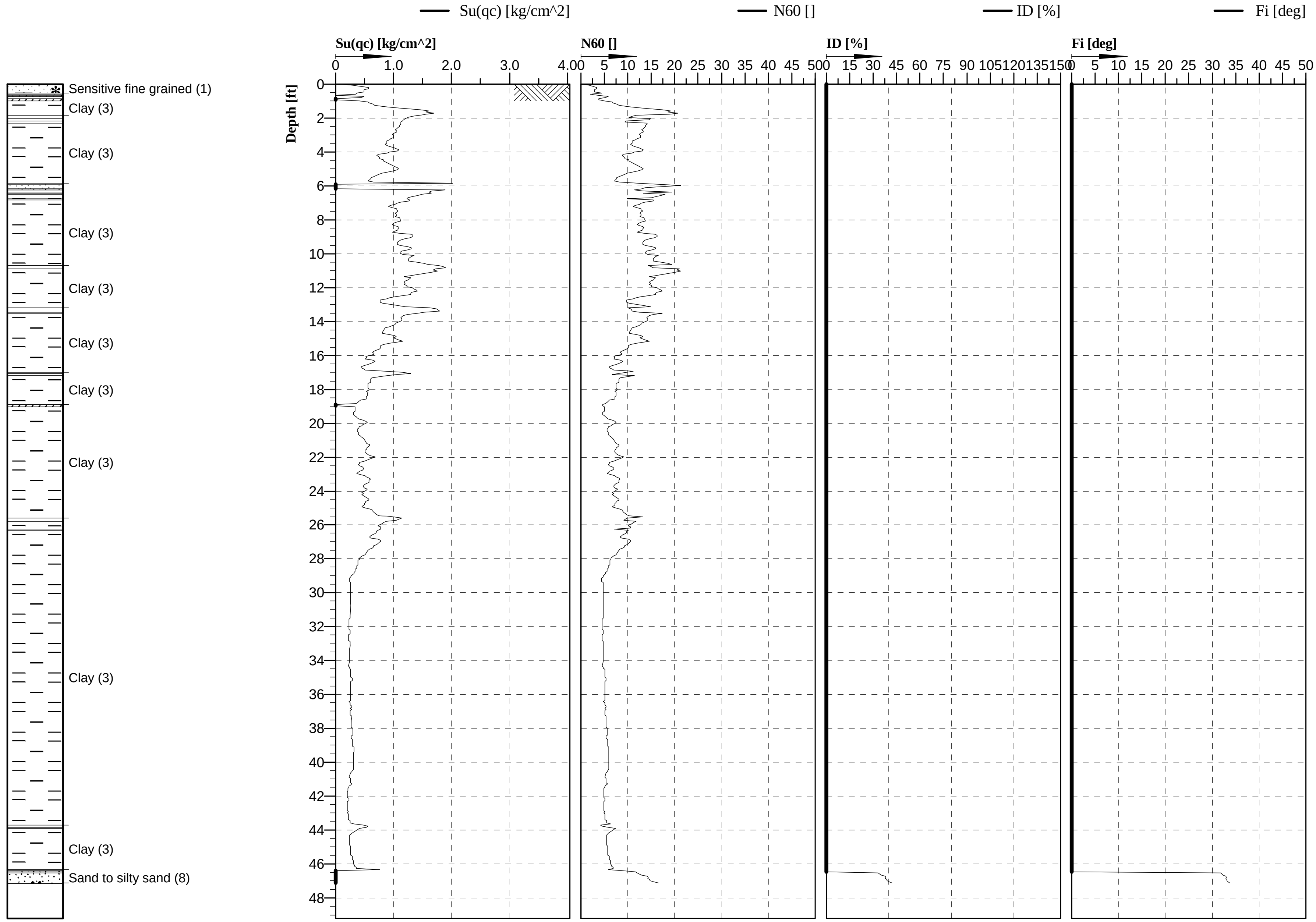
U2

Terracon

Cone No: 0
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Council Bluffs, Iowa	Position:	Ground level: 978.5	Test no: EC-1
Project ID: 05105087	Client: HGM Associates	Date: 9/24/2010	Scale: 1 : 100
Project: WSEC Ash Containment Ponds		Page: 1/2	Fig: EC-1
		File: 5087EC-1m.cpd	

Exhibit A-13

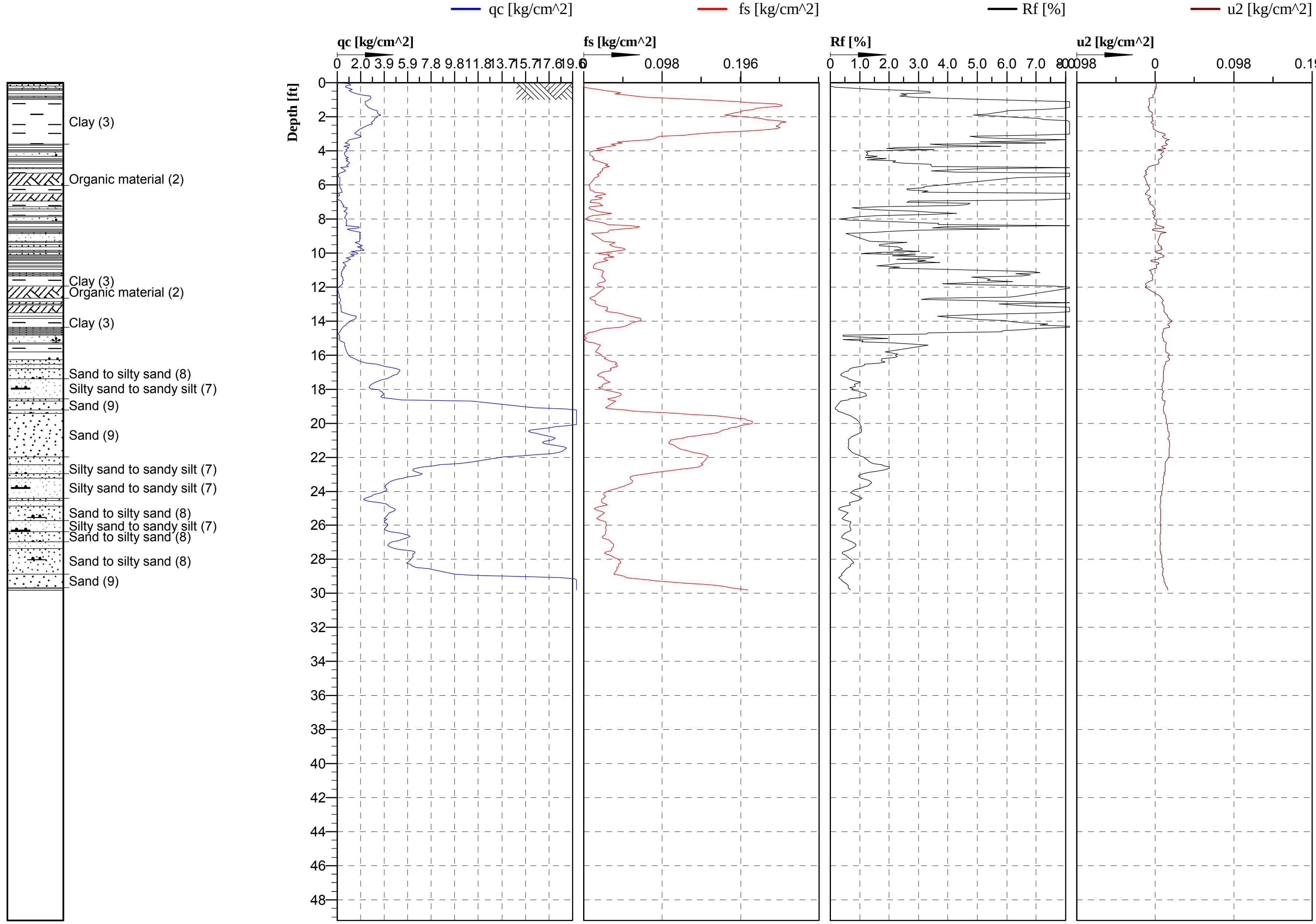


U2

Terracon

Cone No: 0
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Council Bluffs, Iowa	Position:	Ground level: 978.5	Test no: EC-1
Project ID: 05105087	Client: HGM Associates	Date: 9/24/2010	Scale: 1 : 100
Project: WSEC Ash Containment Ponds		Page: 2/2	Fig: EC-1
		File: 5087EC-1m.cpd	

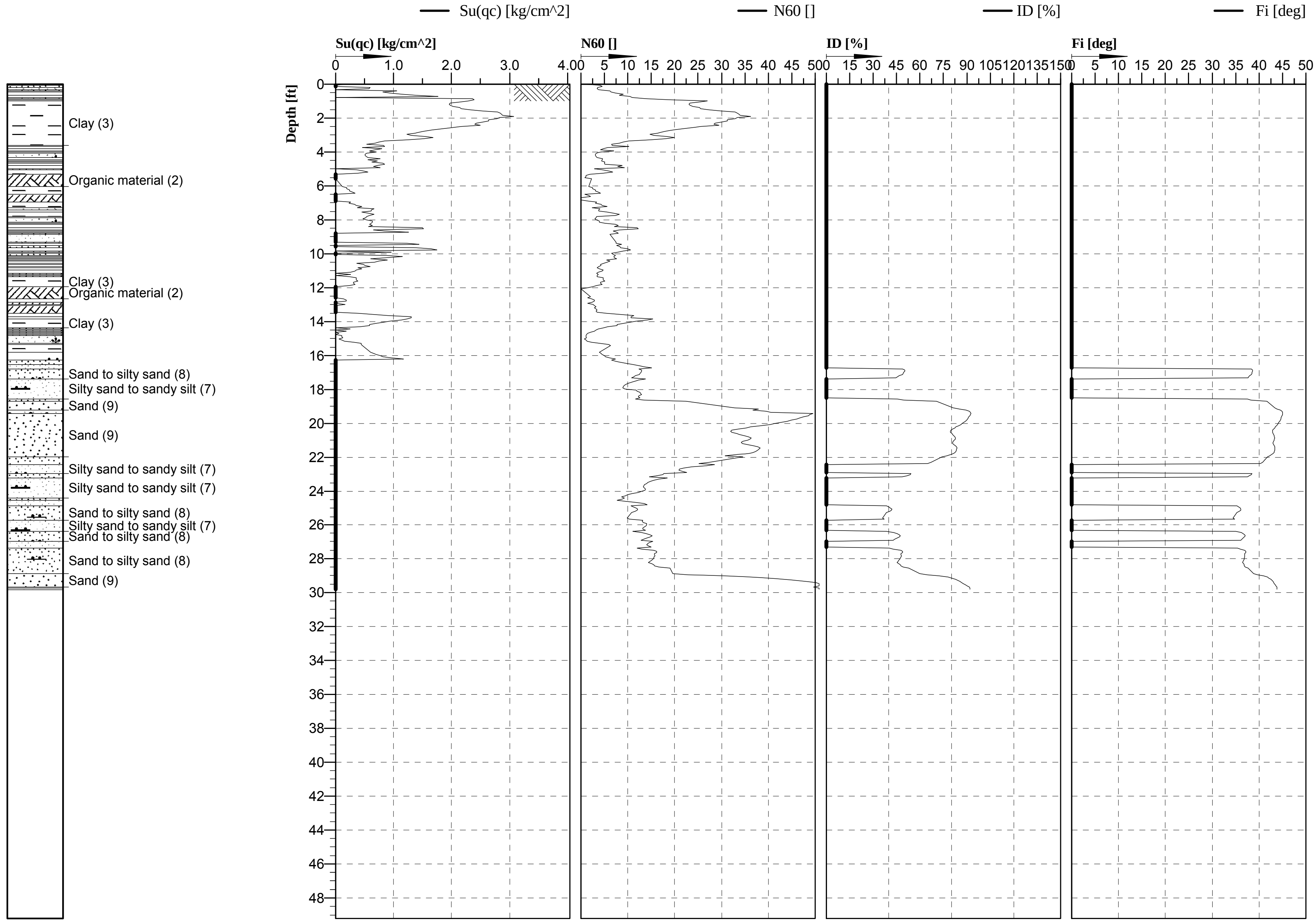


U2

Cone No: 0
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Council Bluffs, Iowa	Position:	Ground level: 980	Test no: EC-3
Project ID: 05105087	Client: HGM Associates	Date: 9/24/2010	Scale: 1 : 100
Project: WSEC Ash Containment Ponds		Page: 1/2	Fig: EC-3
		File: 5087EC-3m.cpd	

Exhibit A-15

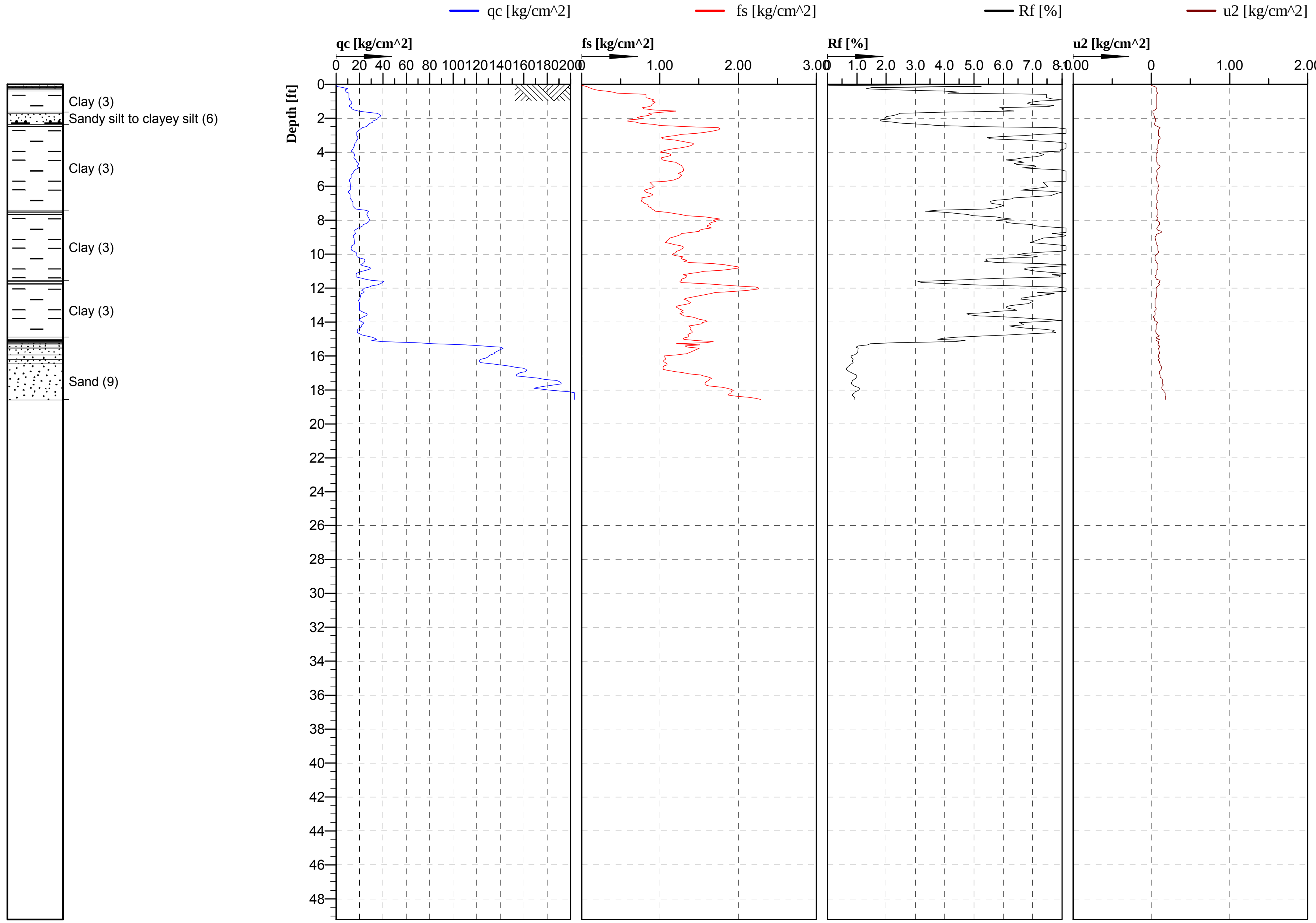


Terracon

Cone No: 0
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Council Bluffs, Iowa	Position:	Ground level: 980	Test no: EC-3
Project ID: 05105087	Client: HGM Associates	Date: 9/24/2010	Scale: 1 : 100
Project: WSEC Ash Containment Ponds		Page: 2/2	Fig: EC-3
		File: 5087EC-3m.cpd	

Exhibit A-16

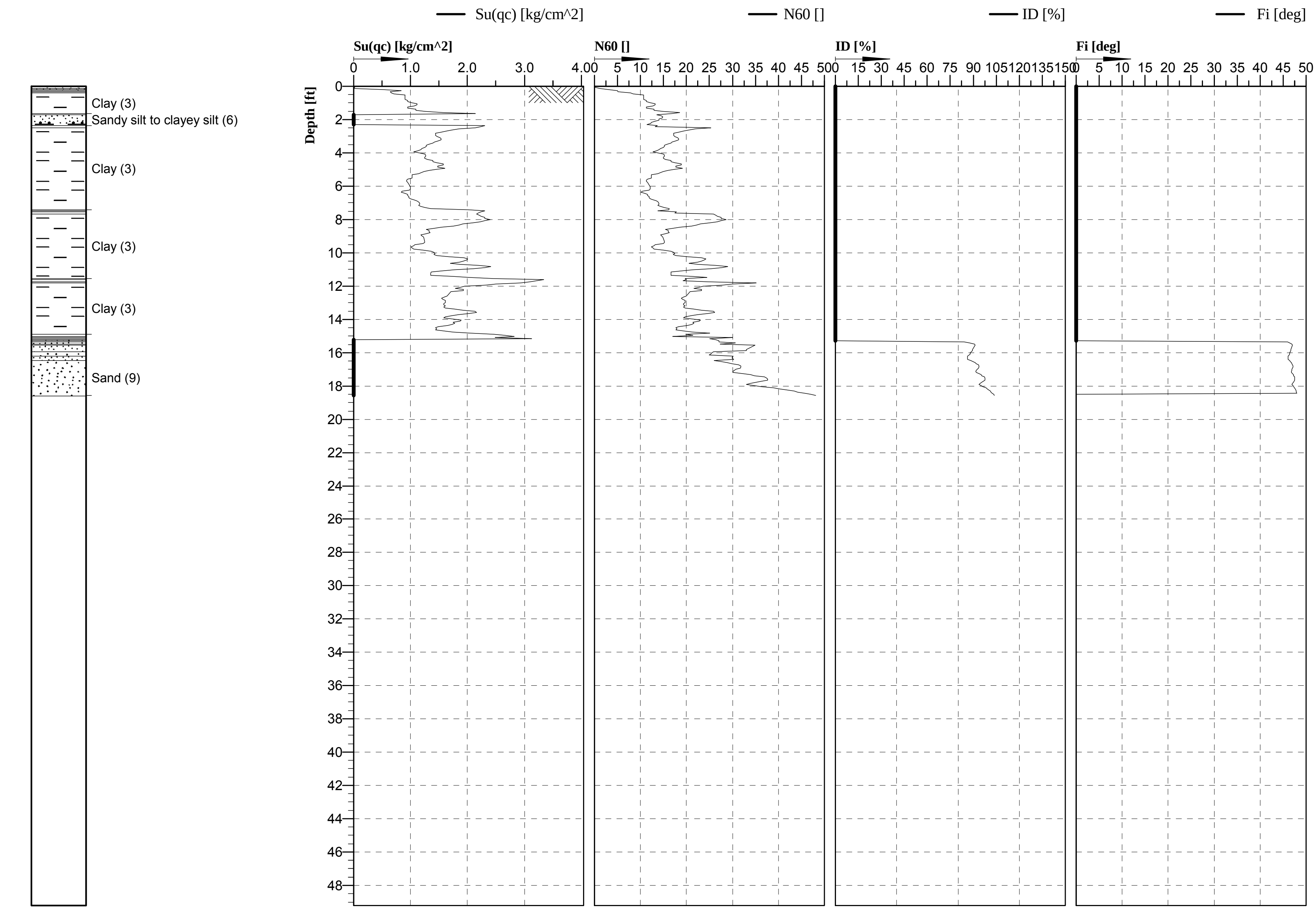


Terracon

Cone No: 0
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Council Bluffs, Iowa	Position:	Ground level: 980	Test no: EC-4
Project ID: 05105087	Client: HGM Associates	Date: 9/24/2010	Scale: 1 : 100
Project: WSEC Ash Containtment Ponds		Page: 1/2	Fig: EC-4
		File: 5087EC-4m.cpd	

Exhibit A-17



Cone No: 0
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Council Bluffs, Iowa	Position:	Ground level: 980	Test no: EC-4
Project ID: 05105087	Client: HGM Associates	Date: 9/24/2010	Scale: 1 : 100
Project: WSEC Ash Containtment Ponds		Page: 2/2	Fig: EC-4
		File: 5087EC-4m.cpd	

Exhibit A-18

Field Exploration Description

The drill crew staked the boring and cone sounding locations relative to the cross-section locations which had been staked by HGM. The borings were completed near the center of the levee crest, or in the case of Boring 1 and Cone sounding EC-1, were completed near the roadway shoulder. Distances were measured with a mechanical wheel or nylon tape and right angles for these measurements were estimated. The approximate boring locations are shown on the Boring Location Diagram included in Appendix A. The locations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

Ground surface elevations indicated on the boring logs are approximate and have been rounded to the nearest ½-foot. The elevations were estimated from the levee cross sections provided by HGM Associates, Inc. The elevations of the soil borings should be considered accurate only to the degree implied by the means and methods used to define them.

The borings were advanced with a both track and truck-mounted drilling rigs utilizing continuous flight hollow-stem augers and rotary wash methods to advance the boreholes. Representative samples were obtained using thin-walled tube and split-barrel sampling procedures. In the thin-walled tube sampling procedure, a thin-walled, 3-inch OD, seamless steel tube with a sharp cutting edge is pushed hydraulically into the ground to obtain relatively undisturbed samples of cohesive or moderately cohesive soils. In the split-barrel sampling procedure, a standard 2-inch O.D. split-barrel sampling spoon is driven into the ground with an automated 140-pound hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the standard penetration resistance value. These values are indicated on the boring logs at the depths of occurrence. The samples were sealed and transported to the laboratory for testing and classification. The boreholes were grouted with a cement-bentonite slurry.

The drill crew prepared a field log for each boring. Each log included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. The boring logs included with this report represent an interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

We also performed electronic piezo-cone penetrometer soundings for this project. This device includes a cone-tipped sounding unit attached to steel rods with flush joint couplings. The sounding unit has electronic strain gauges that measure point resistance and sleeve friction, a transducer that measures pore water pressure and an inclinometer that measures verticality of the sounding unit. The readings from the cone instruments are transmitted acoustically through the rods to a computer at the surface that stores the data and provides real-time display of the cone results. A depth encoder device monitors penetration as the rods are pushed slowly into the ground. The cone unit records the measured values at 2-cm intervals. The resistance to penetration and pore water pressure can be correlated with soil strength and density properties, and soil type can be estimated. Results of the cone penetrometer testing provide valuable information on in-situ soil characteristics and stratigraphy for stability, bearing capacity and settlement analyses.

APPENDIX B

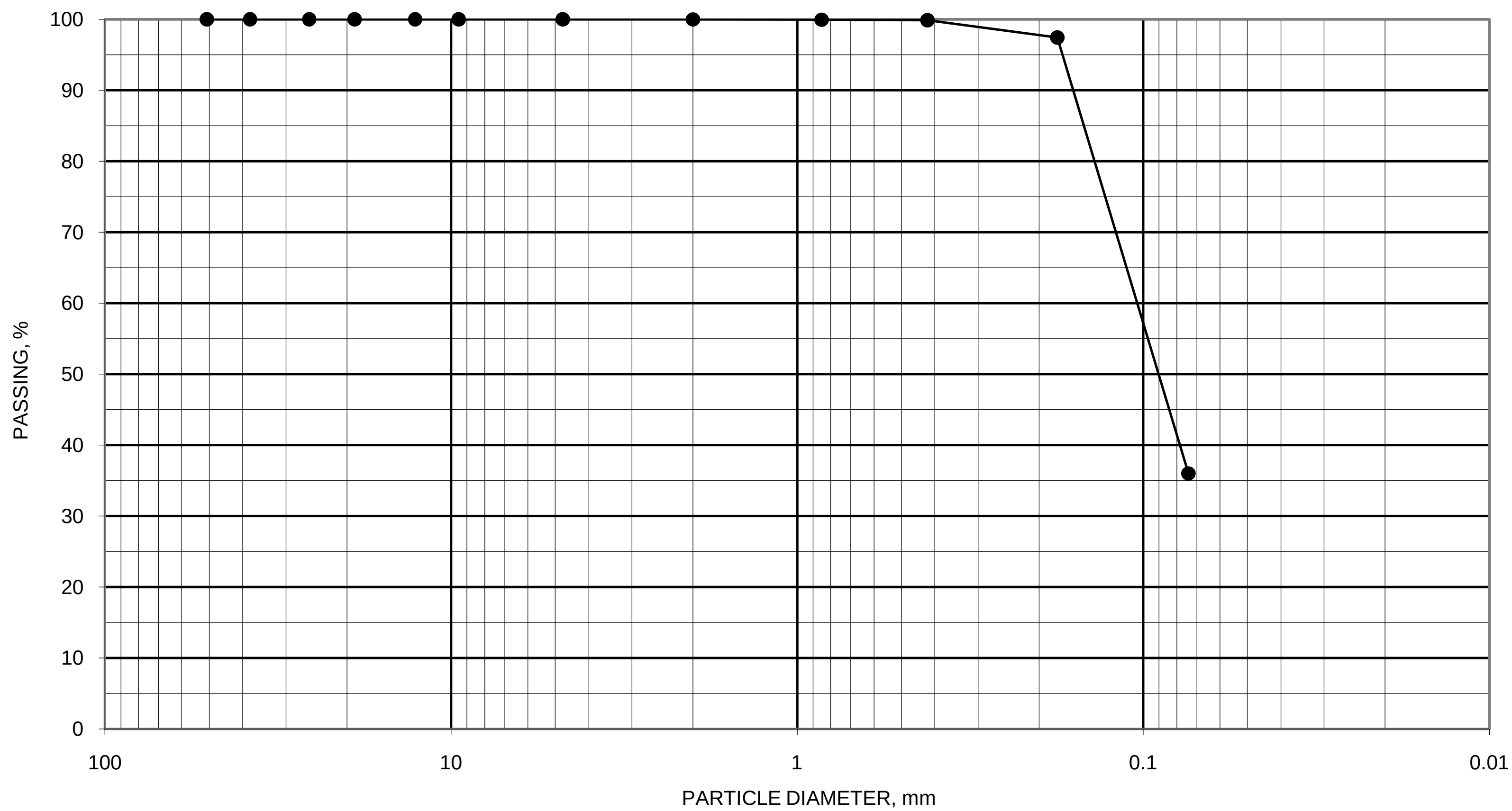
LABORATORY TESTING

Laboratory Testing

Moisture content tests were performed on the samples. Density determinations were made on most of the thin-walled tube samples. The unconfined compressive strength of most of the cohesive samples was estimated with a hand penetrometer. The results of these laboratory tests are provided on the boring logs. In addition, sixteen Atterberg limits, ten grain size analyses, one unconfined compression test, three unconsolidated, undrained triaxial tests, and two consolidated, undrained triaxial tests were completed for this project. The results of the Atterberg limits tests are provided on the boring logs. The results of the laboratory tests are provided in Appendix B.

The samples were classified in the laboratory based on visual observation, texture and plasticity. Additional laboratory testing could be performed to more accurately classify the samples. The soil descriptions presented on the boring logs for native soils are in accordance with our enclosed General Notes and Unified Soil Classification System (USCS). The estimated group symbol for the USCS is also shown on the boring logs for native soils, and a brief description of the Unified System is included with this report.

SIEVE SIZE	DIAMETER, mm	PASS, %
2"	50.8	100
1.5"	38.1	100
1"	25.7	100
3/4"	19.0	100
1/2"	12.7	100
3/8"	9.5	100
#4	4.76	100
#10	2.00	100
#20	0.85	100
#40	0.42	100
#80	0.177	97
#200	0.074	36



GRAIN SIZE DISTRIBUTION CURVE

BORING ID	SAMPLE ID	DEPTH, feet	SPECIMEN DESCRIPTION	UNIFIED SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
1	2	3 TO 5	GRAYISH BROWN CLAYEY SAND	SC	13.0			

*TESTED IN OMAHA

PROJECT WSEC ASH CONTAINMENT PONDS

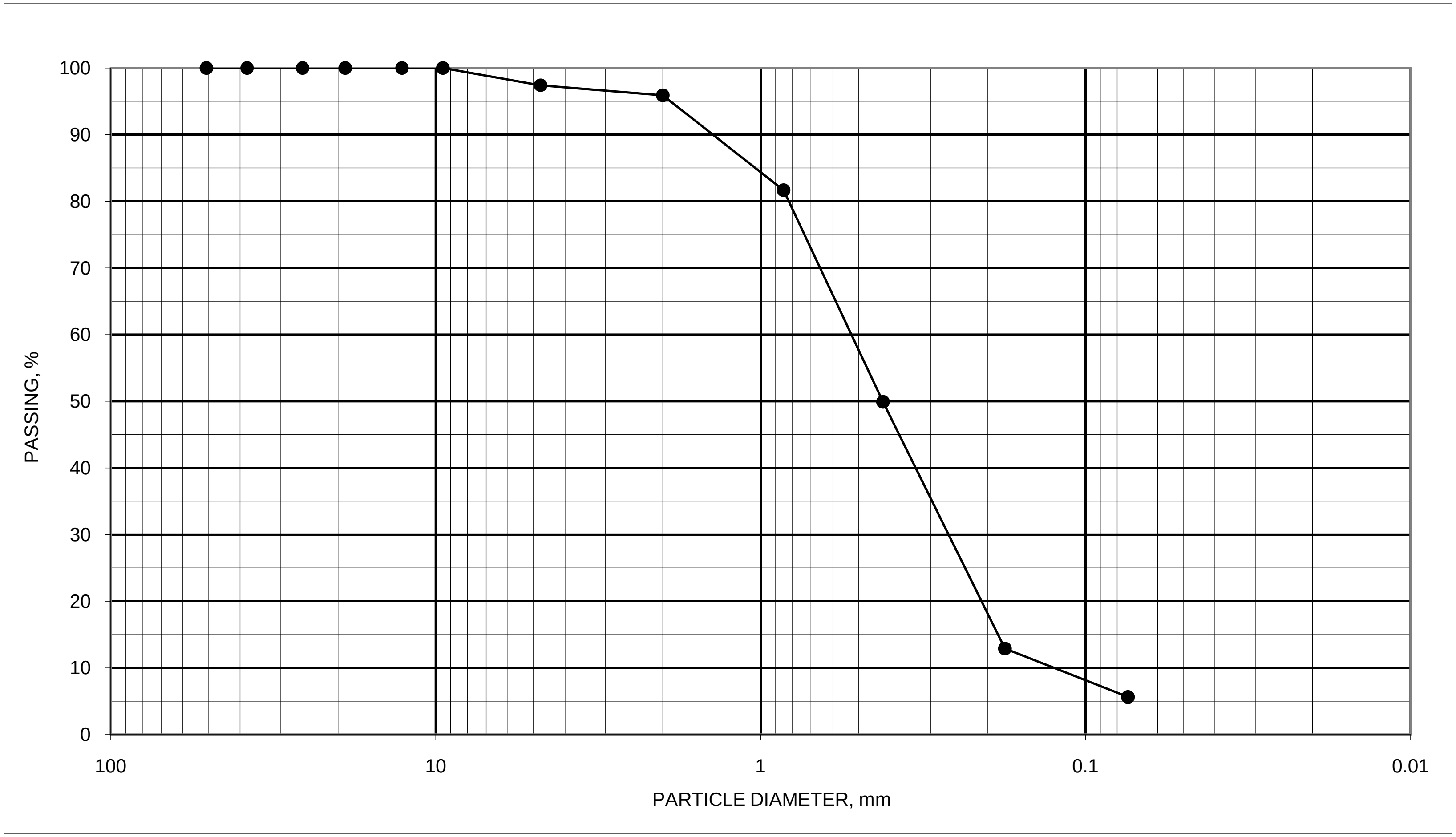
COUNCIL BLUFFS, IA JOB NO. 05105087 DATE 9/30/10

Terracon

N:\Projects\2010\05105087\Omaha Lab\Sieves\[05105087 Sieve B-1, S-2, 3-5' 9-30-10.xls]REPORT

SIEVE SIZE	DIAMETER, mm	PASS, %
2"	50.8	100
1.5"	38.1	100
1"	25.7	100
3/4"	19.0	100
1/2"	12.7	100
3/8"	9.5	100
#4	4.76	97
#10	2.00	96
#20	0.85	82
#40	0.42	50
#80	0.177	13
#200	0.074	6

D10	0.1251
Cu	4.2
Cc	1.1



GRAIN SIZE DISTRIBUTION CURVE

BORING ID	SAMPLE ID	DEPTH, feet	SPECIMEN DESCRIPTION	UNIFIED SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
1	10	38.5 TO 40	GRAY POORLY GRADED SAND WITH SILT	SP-SM				

*TESTED IN OMAHA

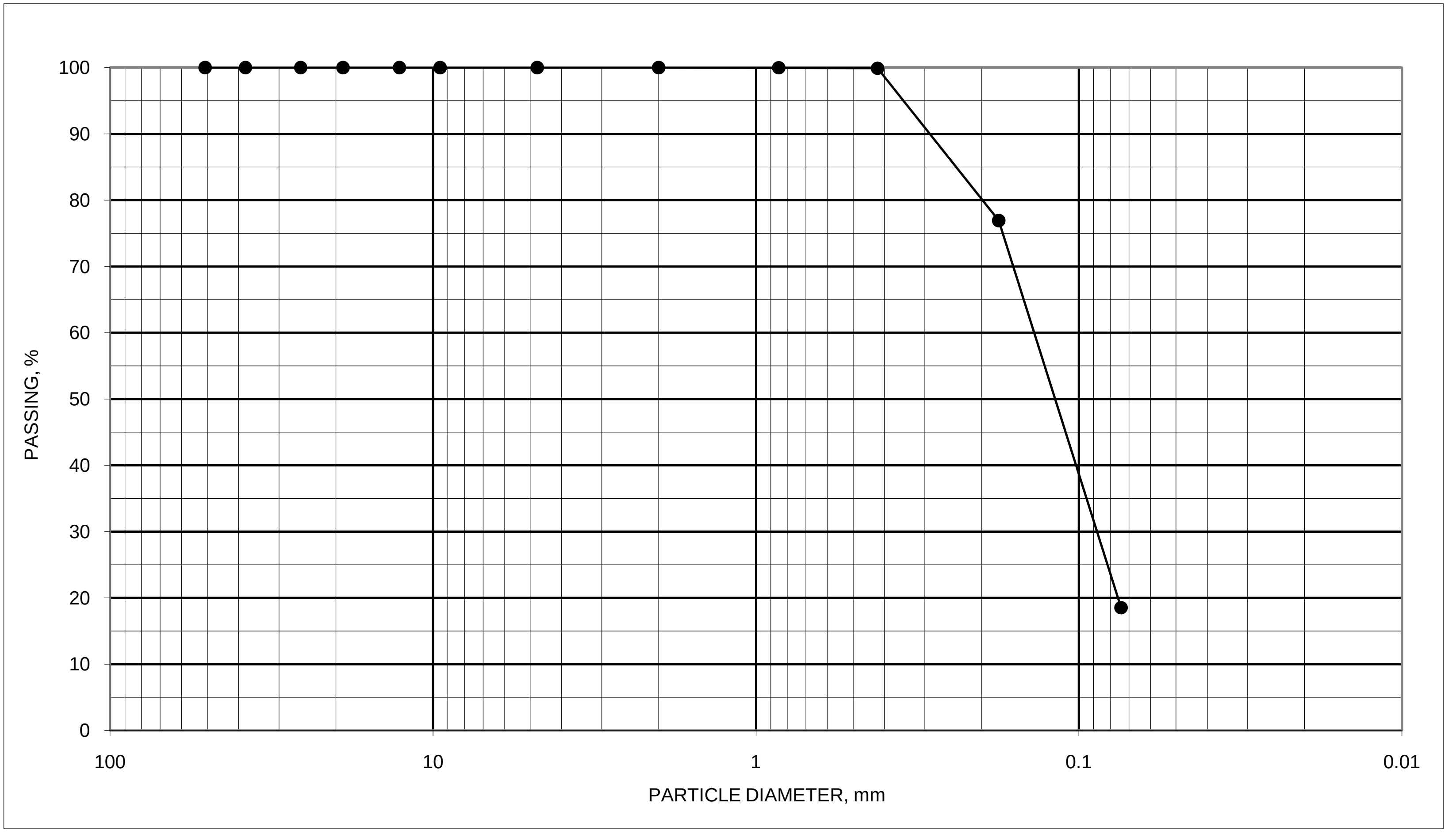
PROJECT WSEC ASH CONTAINMENT PONDS

COUNCIL BLUFFS, IA JOB NO. 05105087 DATE 9/30/10

N:\Projects\2010\05105087\Omaha Lab\Sieves\[05105087 Sieve B-1, S-10, 38.5-40' 9-30-10.xls]REPORT

Terracon

SIEVE SIZE	DIAMETER, mm	PASS, %
2"	50.8	100
1.5"	38.1	100
1"	25.7	100
3/4"	19.0	100
1/2"	12.7	100
3/8"	9.5	100
#4	4.76	100
#10	2.00	100
#20	0.85	100
#40	0.42	100
#80	0.177	77
#200	0.074	19



GRAIN SIZE DISTRIBUTION CURVE

BORING ID	SAMPLE ID	DEPTH, feet	SPECIMEN DESCRIPTION	UNIFIED SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
4	3	5 TO 7	GRAYISH BROWN SILTY SAND	SM				

*TESTED IN OMAHA

PROJECT WSEC ASH CONTAINMENT PONDS

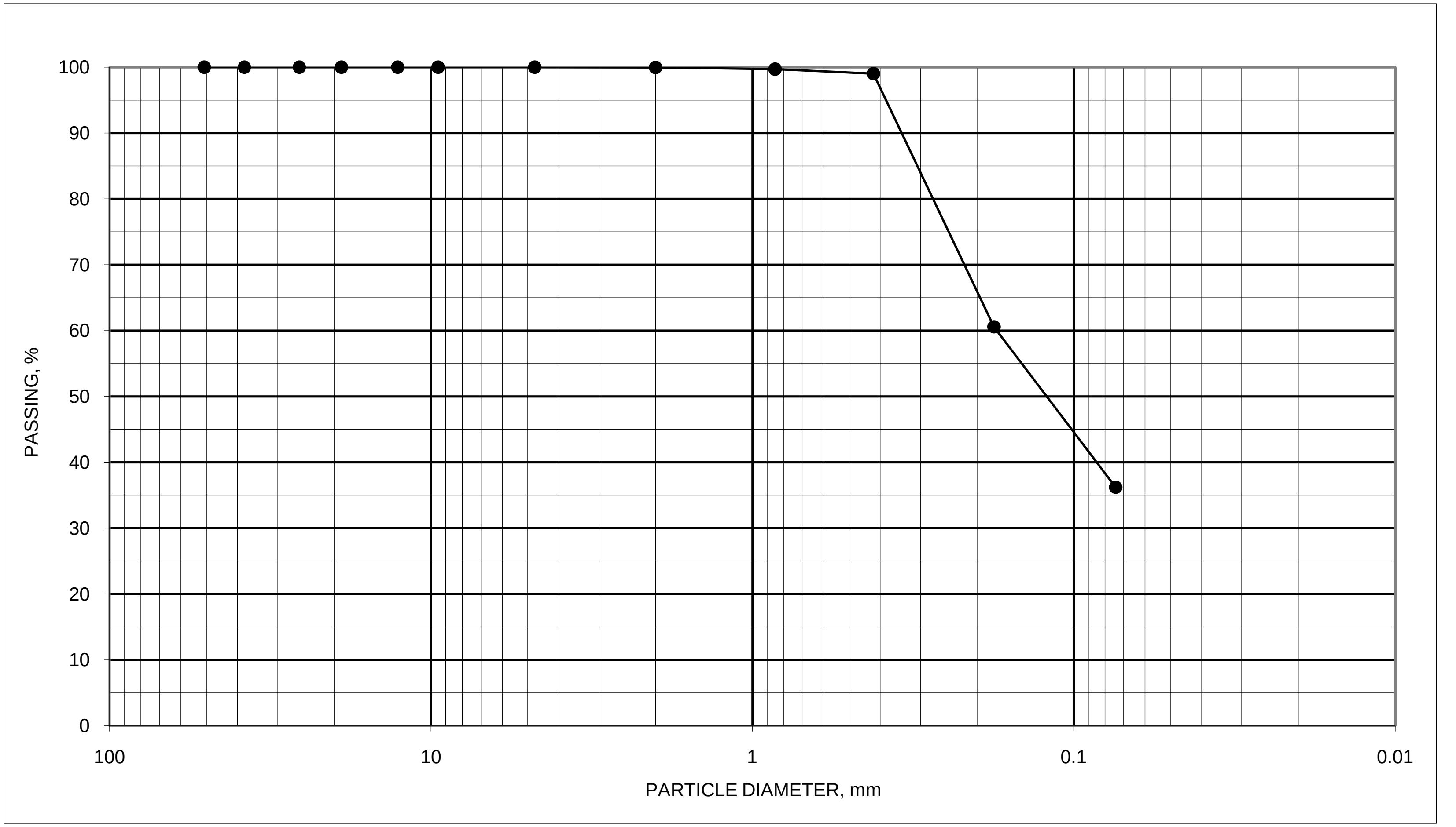
COUNCIL BLUFFS, IA JOB NO. 05105087 DATE 9/30/10

N:\Projects\2010\05105087\Omaha Lab\Sieves\[05105087 Sieve B-4, S-3, 5-7' 9-30-10.xls]REPORT

Terracon

Exhibit B-4

SIEVE SIZE	DIAMETER, mm	PASS, %
2"	50.8	100
1.5"	38.1	100
1"	25.7	100
3/4"	19.0	100
1/2"	12.7	100
3/8"	9.5	100
#4	4.76	100
#10	2.00	100
#20	0.85	100
#40	0.42	99
#80	0.177	61
#200	0.074	36



GRAIN SIZE DISTRIBUTION CURVE

BORING ID	SAMPLE ID	DEPTH, feet	SPECIMEN DESCRIPTION	UNIFIED SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
4	6	18.5 TO 20	GRAY & GRAYISH BROWN CLAYEY SAND	SC		29	15	14

*TESTED IN OMAHA

PROJECT WSEC ASH CONTAINMENT PONDS

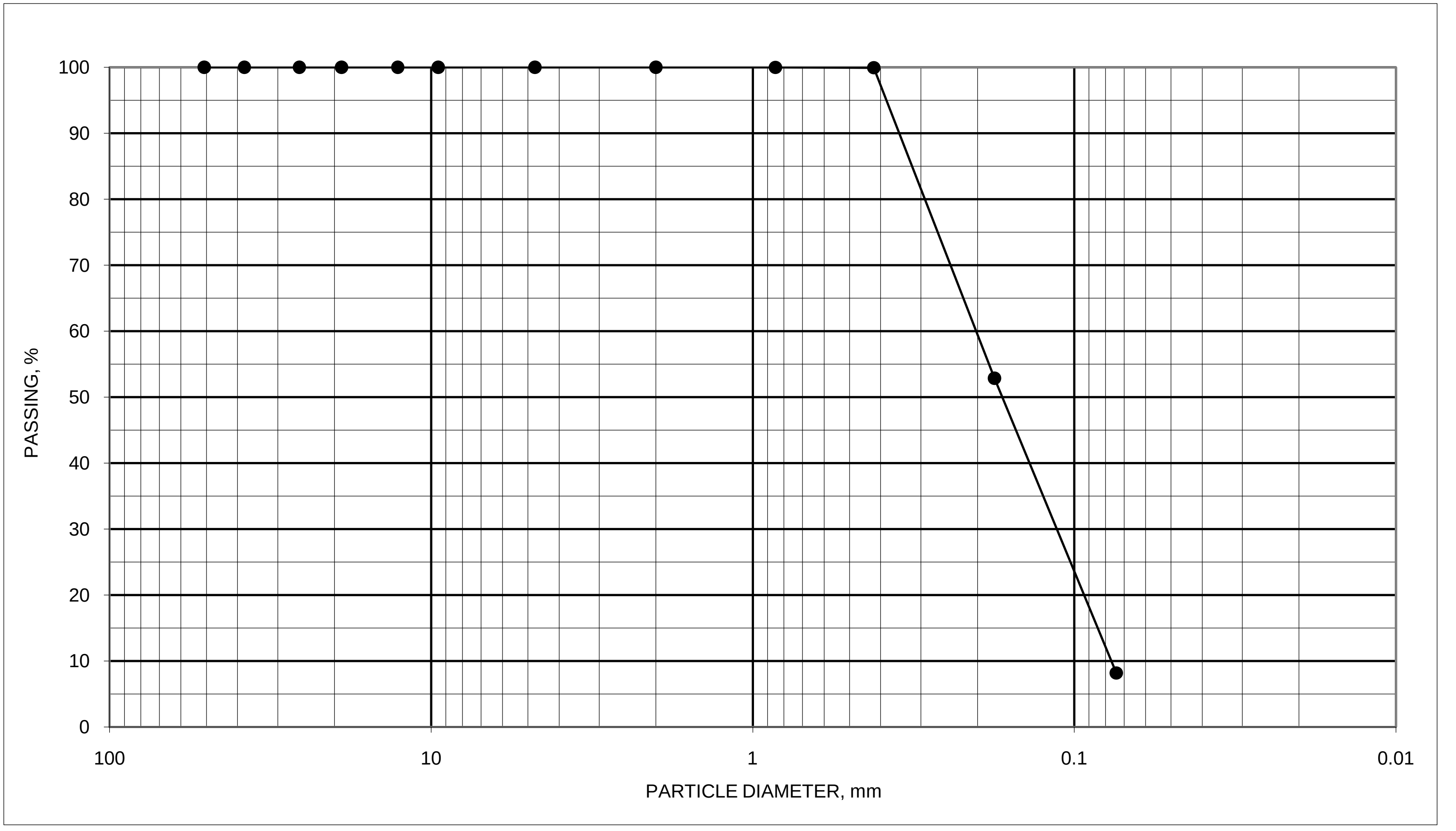
COUNCIL BLUFFS, IA JOB NO. 05105087 DATE 9/30/10

N:\Projects\2010\05105087\Omaha Lab\Sieves\[05105087 Sieve B-4, S-6, 18.5-20' 9-30-10.xls]REPORT

Terracon

SIEVE SIZE	DIAMETER, mm	PASS, %
2"	50.8	100
1.5"	38.1	100
1"	25.7	100
3/4"	19.0	100
1/2"	12.7	100
3/8"	9.5	100
#4	4.76	100
#10	2.00	100
#20	0.85	100
#40	0.42	100
#80	0.177	53
#200	0.074	8

D10	0.0767
Cu	2.6
Cc	0.8



GRAIN SIZE DISTRIBUTION CURVE

BORING ID	SAMPLE ID	DEPTH, feet	SPECIMEN DESCRIPTION	UNIFIED SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
4	7	23.5 TO 25	GRAY POORLY GRADED SAND WITH SILT	SP-SM				

*TESTED IN OMAHA

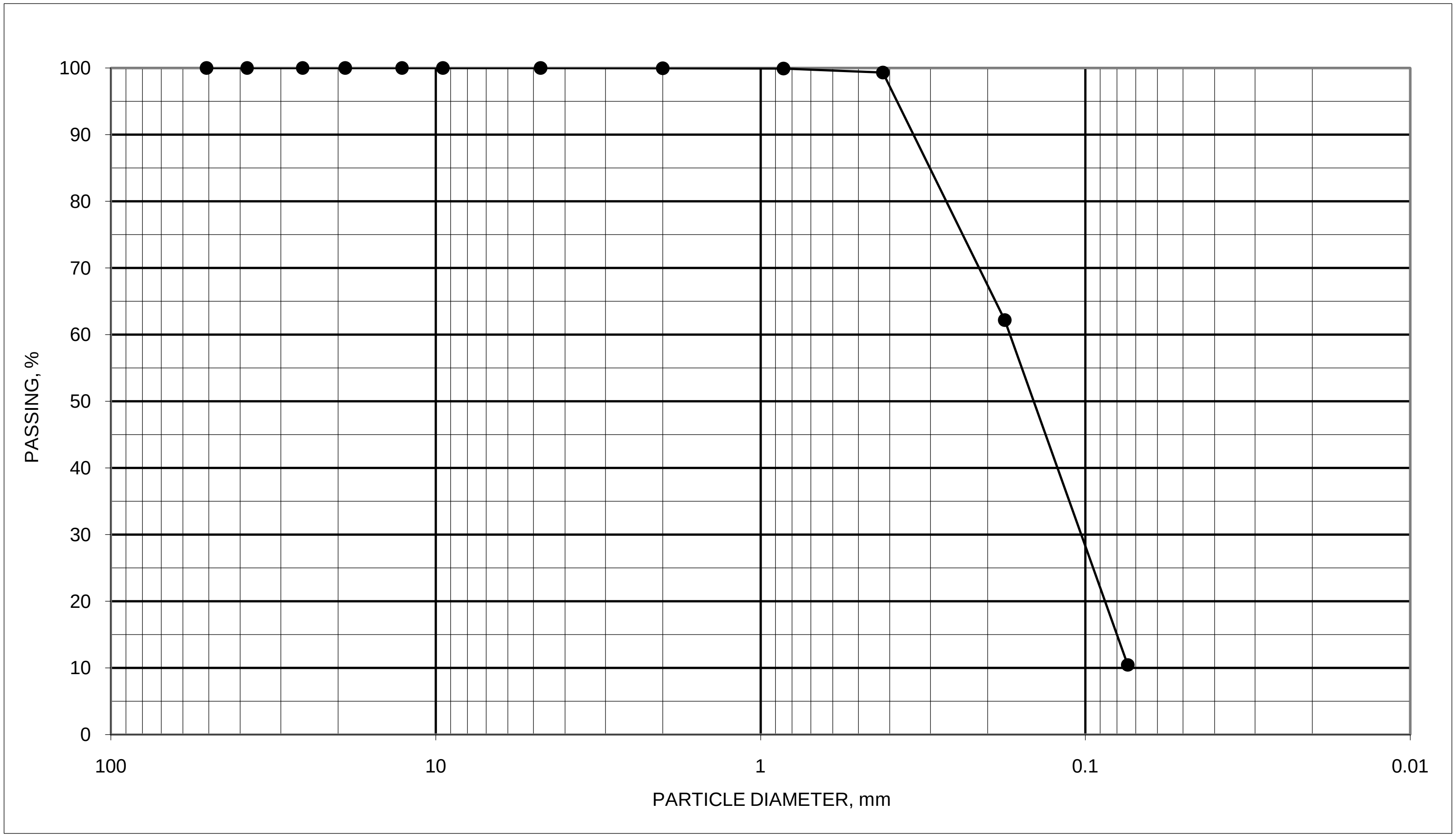
PROJECT WSEC ASH CONTAINMENT PONDS

COUNCIL BLUFFS, IA JOB NO. 05105087 DATE 9/30/10

N:\Projects\2010\05105087\Omaha Lab\Sieves\[05105087 Sieve B-4, S-7, 23.5-25' 9-30-10.xls]REPORT

Terracon

SIEVE SIZE	DIAMETER, mm	PASS, %
2"	50.8	100
1.5"	38.1	100
1"	25.7	100
3/4"	19.0	100
1/2"	12.7	100
3/8"	9.5	100
#4	4.76	100
#10	2.00	100
#20	0.85	100
#40	0.42	99
#80	0.177	62
#200	0.074	10



GRAIN SIZE DISTRIBUTION CURVE

BORING ID	SAMPLE ID	DEPTH, feet	SPECIMEN DESCRIPTION	UNIFIED SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
4	11	43.5 TO 45	GRAY POORLY GRADED SAND WITH SILT	SP-SM				

*TESTED IN OMAHA

PROJECT WSEC ASH CONTAINMENT PONDS

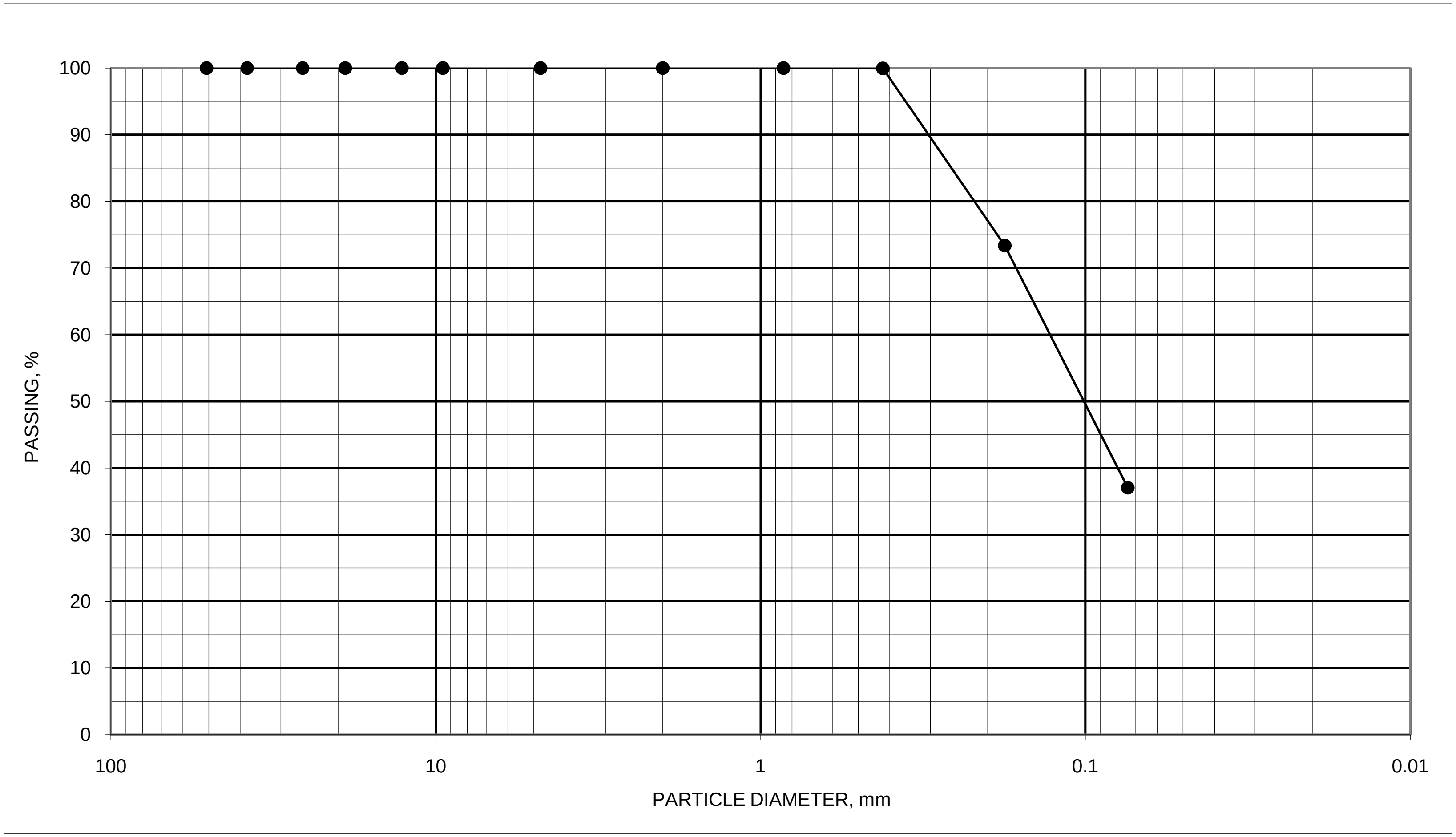
COUNCIL BLUFFS, IA JOB NO. 05105087 DATE 9/30/10

N:\Projects\2010\05105087\Omaha Lab\Sieves\[05105087 Sieve B-4, S-11, 43.5-45' 9-30-10.xls]REPORT

Terracon

Exhibit B-7

SIEVE SIZE	DIAMETER, mm	PASS, %
2"	50.8	100
1.5"	38.1	100
1"	25.7	100
3/4"	19.0	100
1/2"	12.7	100
3/8"	9.5	100
#4	4.76	100
#10	2.00	100
#20	0.85	100
#40	0.42	100
#80	0.177	73
#200	0.074	37



GRAIN SIZE DISTRIBUTION CURVE

BORING ID	SAMPLE ID	DEPTH, feet	SPECIMEN DESCRIPTION	UNIFIED SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
5	7	23 TO 25	GRAY SILTY SAND	SM				

*TESTED IN OMAHA

PROJECT WSEC ASH CONTAINMENT PONDS

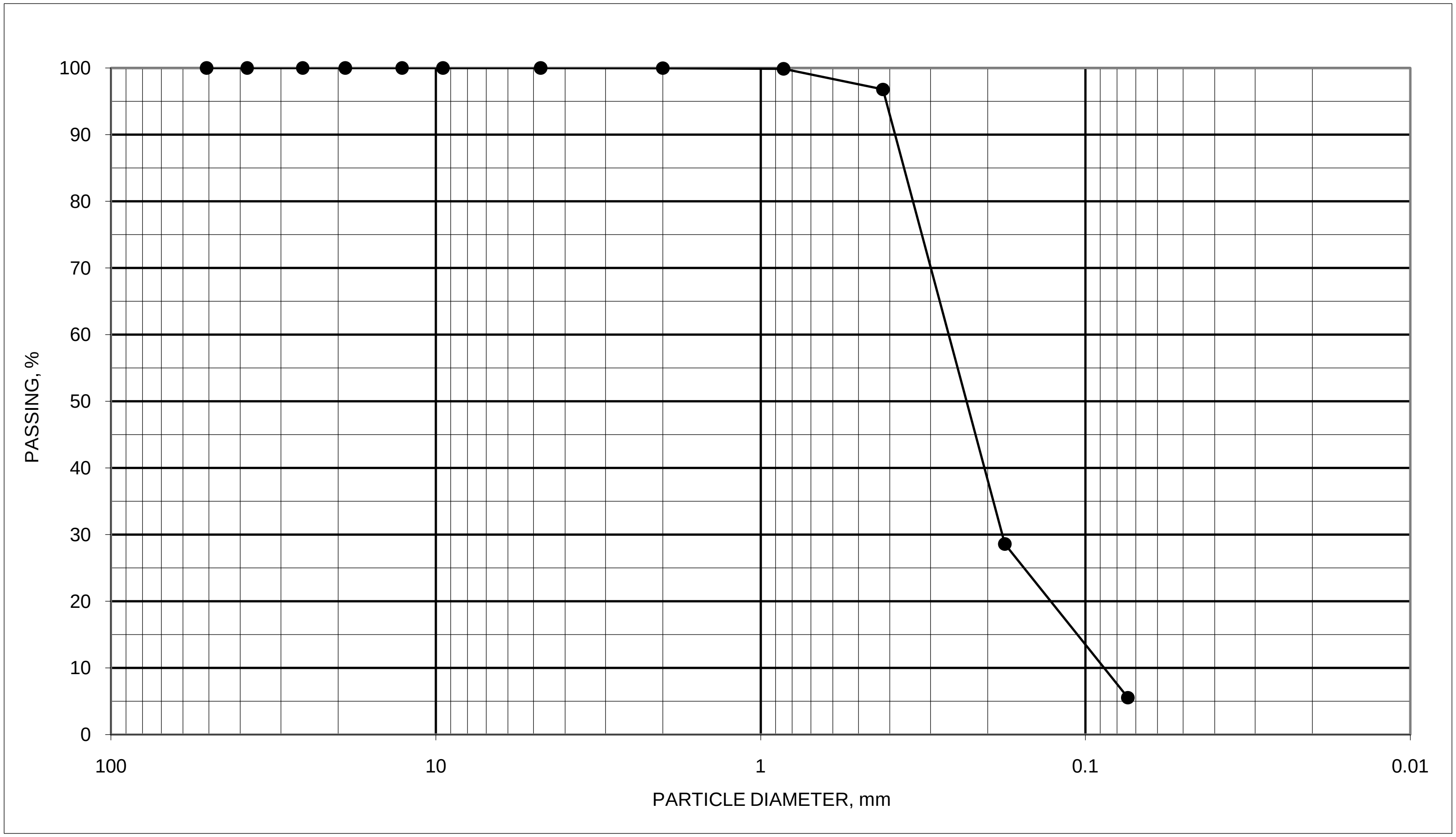
COUNCIL BLUFFS, IA JOB NO. 05105087 DATE 9/30/10

N:\Projects\2010\05105087\Omaha Lab\Sieves\[05105087 Sieve B-5, S-7, 23-25' 9-30-10.xls]REPORT

Terracon

SIEVE SIZE	DIAMETER, mm	PASS, %
2"	50.8	100
1.5"	38.1	100
1"	25.7	100
3/4"	19.0	100
1/2"	12.7	100
3/8"	9.5	100
#4	4.76	100
#10	2.00	100
#20	0.85	100
#40	0.42	97
#80	0.177	29
#200	0.074	6

D10	0.0877
Cu	3.0
Cc	1.4



GRAIN SIZE DISTRIBUTION CURVE

BORING ID	SAMPLE ID	DEPTH, feet	SPECIMEN DESCRIPTION	UNIFIED SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
5	11	43 TO 45	GRAY POORLY GRADED SAND WITH SILT	SP-SM				

*TESTED IN OMAHA

PROJECT WSEC ASH CONTAINMENT PONDS

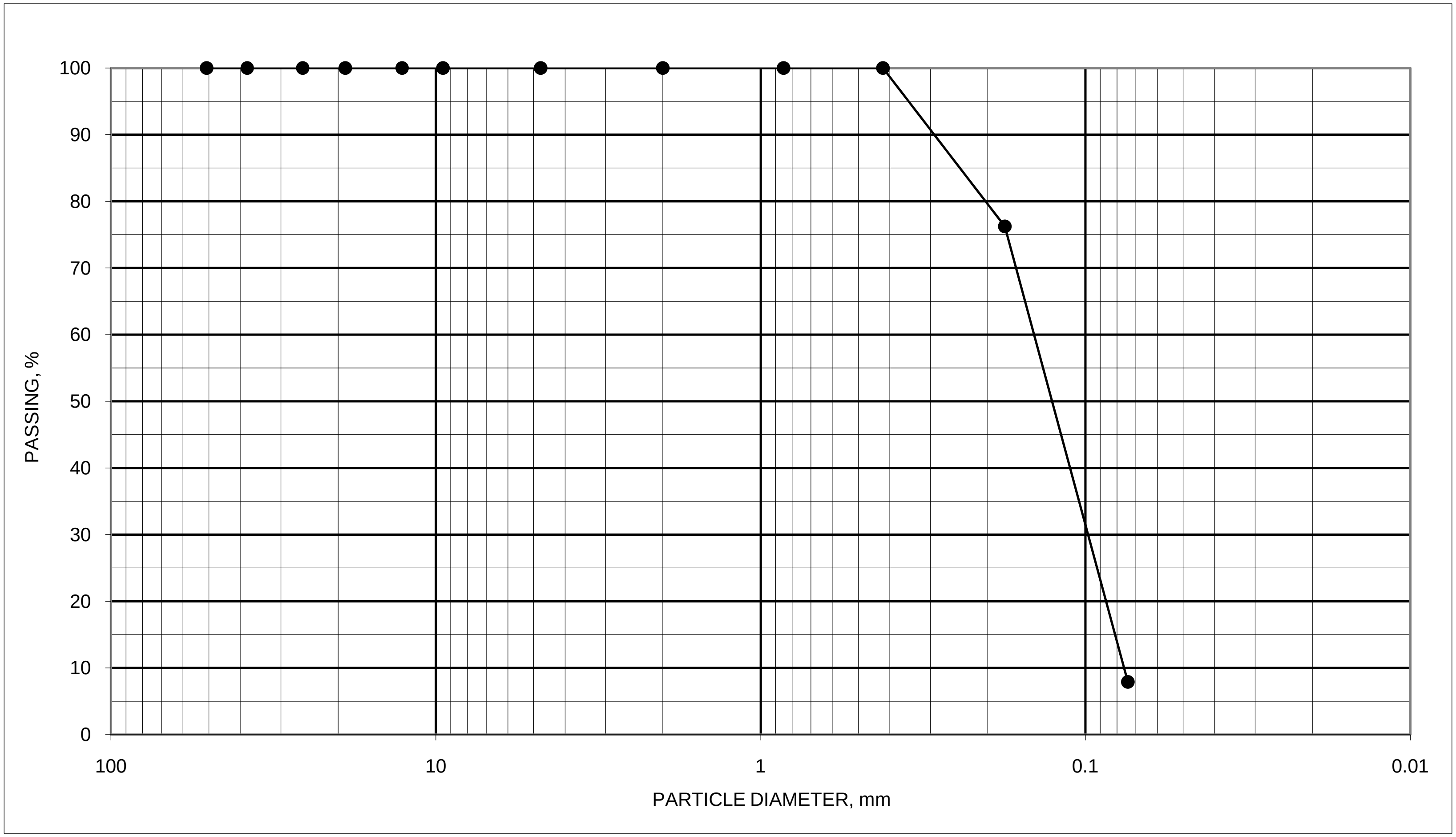
COUNCIL BLUFFS, IA JOB NO. 05105087 DATE 9/30/10

N:\Projects\2010\05105087\Omaha Lab\Sieves\[05105087 Sieve B-5, S-11, 43-45' 9-30-10.xls]REPORT

Terracon

SIEVE SIZE	DIAMETER, mm	PASS, %
2"	50.8	100
1.5"	38.1	100
1"	25.7	100
3/4"	19.0	100
1/2"	12.7	100
3/8"	9.5	100
#4	4.76	100
#10	2.00	100
#20	0.85	100
#40	0.42	100
#80	0.177	76
#200	0.074	8

D10	0.0760
Cu	1.9
Cc	0.9



GRAIN SIZE DISTRIBUTION CURVE

BORING ID	SAMPLE ID	DEPTH, feet	SPECIMEN DESCRIPTION	UNIFIED SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
6	8	28 TO 30	LIGHT GRAY POORLY GRADED SAND WITH SILT	SP-SM				

*TESTED IN OMAHA

PROJECT WSEC ASH CONTAINMENT PONDS

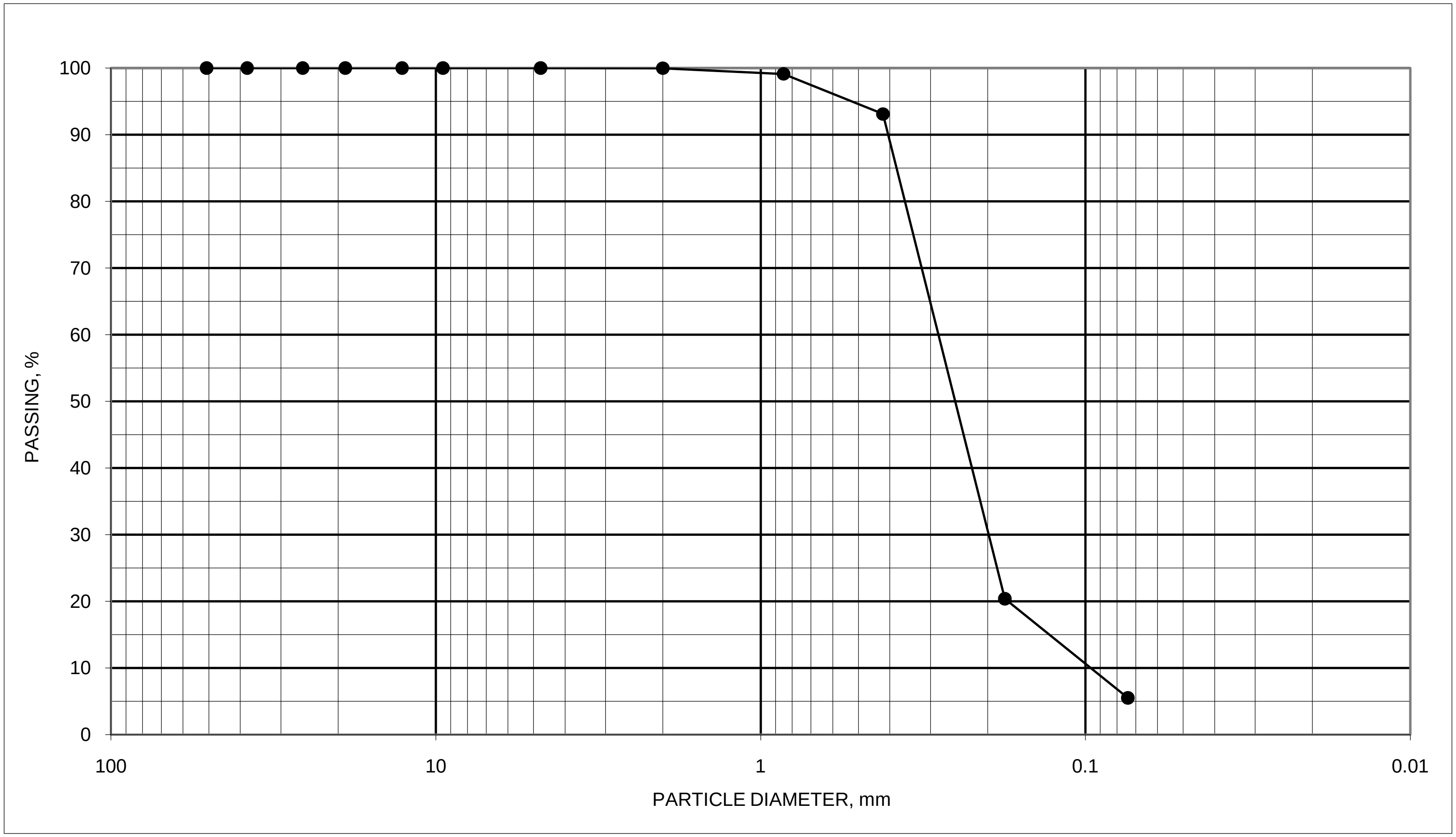
COUNCIL BLUFFS, IA JOB NO. 05105087 DATE 9/30/10

N:\Projects\2010\05105087\Omaha Lab\Sieves\[05105087 Sieve B-6, S-8, 28-30' 9-30-10.xls]REPORT

Terracon

SIEVE SIZE	DIAMETER, mm	PASS, %
2"	50.8	100
1.5"	38.1	100
1"	25.7	100
3/4"	19.0	100
1/2"	12.7	100
3/8"	9.5	100
#4	4.76	100
#10	2.00	100
#20	0.85	99
#40	0.42	93
#80	0.177	20
#200	0.074	5

D10	0.0963
Cu	2.9
Cc	1.4



GRAIN SIZE DISTRIBUTION CURVE

BORING ID	SAMPLE ID	DEPTH, feet	SPECIMEN DESCRIPTION	UNIFIED SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
6	12	48 TO 50	GRAY POORLY GRADED SAND WITH SILT	SP-SM				

*TESTED IN OMAHA

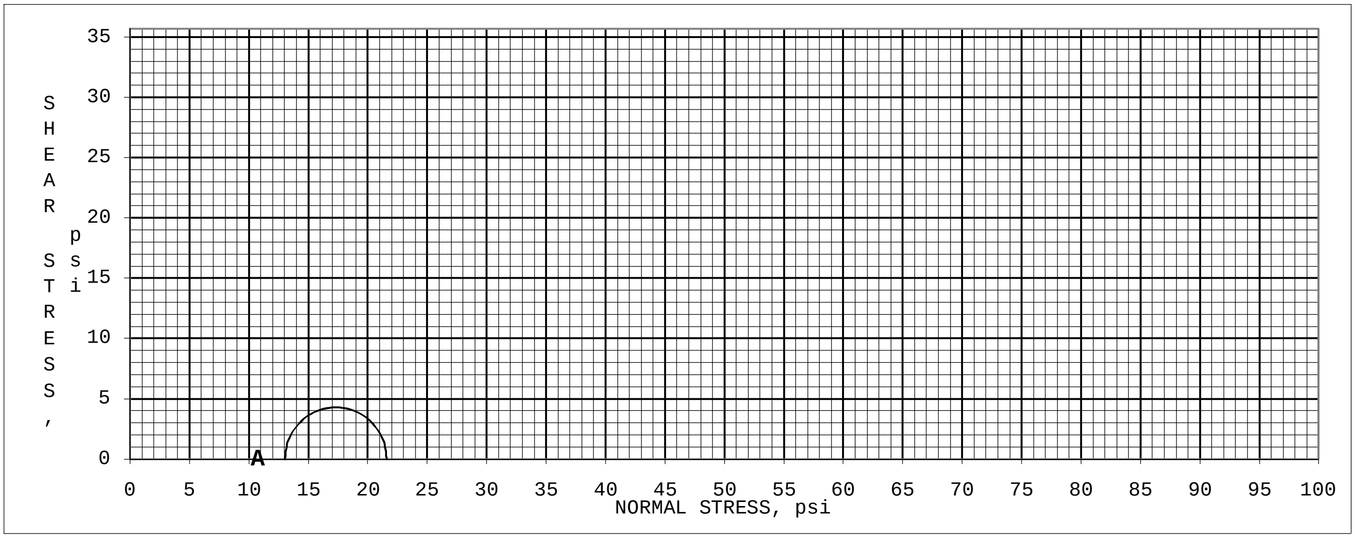
PROJECT WSEC ASH CONTAINMENT PONDS

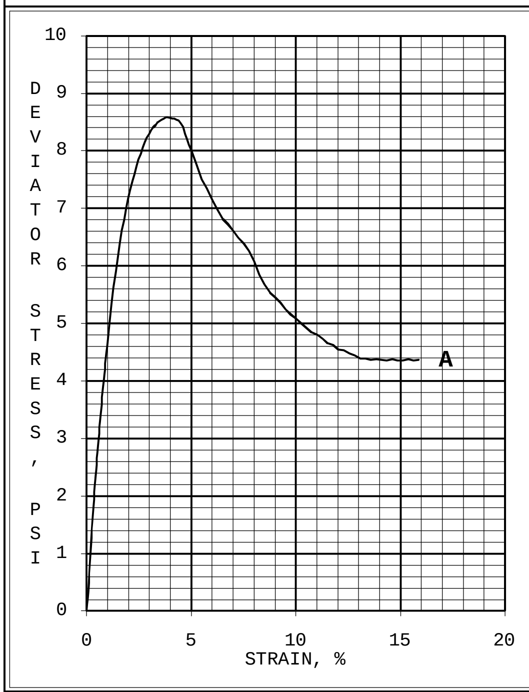
COUNCIL BLUFFS, IA JOB NO. 05105087 DATE 9/30/10

N:\Projects\2010\05105087\Omaha Lab\Sieves\[05105087 Sieve B-6, S-12, 48-50' 9-30-10.xls]REPORT

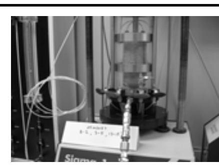
Terracon

Exhibit B-11





SPECIMEN #:		A		
INITIAL	WATER CONTENT, % FROM TRIMMINGS	34.9		
INITIAL	DRY DENSITY, pcf	84.3		
INITIAL	SATURATION, %	94		
INITIAL	VOID RATIO	1.00		
WATER CONTENT, % AFTER SHEAR		35.9		



A

B

C

MINOR PRINCIPAL STRESS, psi	13.0
MOHR'S CIRCLES DRAWN AT % STRAIN	3.9
DEVIATOR STRESS AT % STRAIN, psi	8.6
STRAIN AT PEAK DEVIATOR STRESS, %	3.9
DEVIATOR STRESS AT 15% STRAIN, psi	4.4
INITIAL DIAMETER, inch	2.885
INITIAL HEIGHT, inch	6.340
STRAIN RATE, %/minute	0.30

CONTROLLED - STRAIN TEST

DESCRIPTION OF SPECIMENS: FAT CLAY (CH), MOTTLED BROWN, GRAYISH BROWN, & GRAY

LL 58	PL 24	PI 34	Gs 2.7 EST.	SAMPLE TYPE: 3" SHELBY TUBE	TEST TYPE: UU

REMARKS:

PROJECT: WSEC ASH CONTAINMENT PONDS
COUNCIL BLUFFS, IA 05105087

BORING #: 2

SAMPLE #: 5

DEPTH, feet: 13 - 15

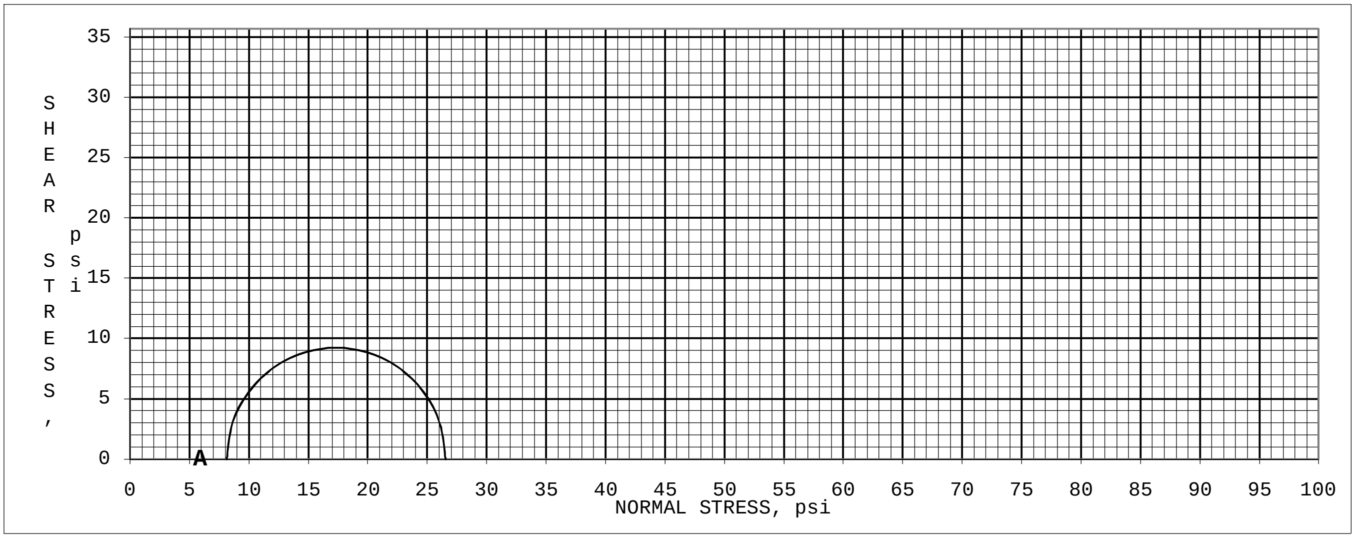
LABORATORY: TERRACON - OMAHA DATE: 9/30/2010

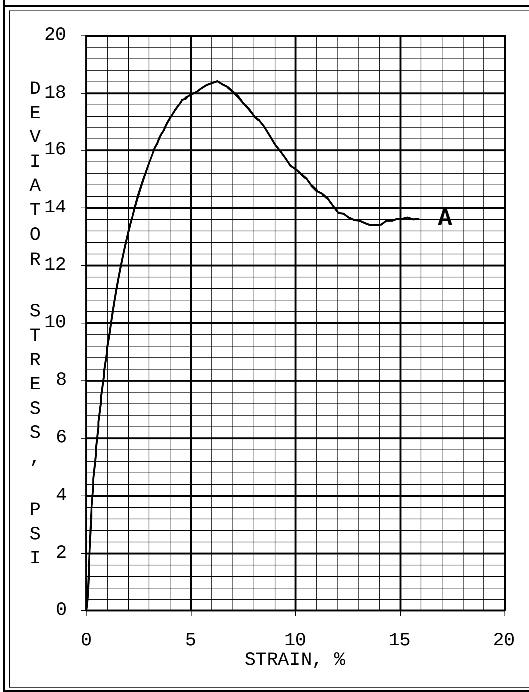
TRIAXIAL COMPRESSION TEST REPORT

PROCEDURE: ASTM D2850, UNCONSOLIDATED, UNDRAINED COMPRESSIVE STRENGTH OF COHESIVE SOILS IN TRIAXIAL COMPRESSION, MEMBRANE CORRECTION APPLIED. OTHER TESTS WERE CONDUCTED IN GENERAL ACCORDANCE WITH ASTMS D2216 AND D4318 IF APPLICABLE.

Terracon

N:\Projects\2010\05105087\Omaha Lab\UU\[05105087 UU B-2, S-5, 13-15' 9-30-10.xls]REPORT





SPECIMEN #:		A		
INITIAL	WATER CONTENT, % FROM TRIMMINGS	16.3		
	DRY DENSITY, pcf	104.7		
	SATURATION, %	72		
	VOID RATIO	0.61		
WATER CONTENT, % AFTER SHEAR		20.6		

A B C

MINOR PRINCIPAL STRESS, psi	8.1		
MOHR'S CIRCLES DRAWN AT % STRAIN	6.3		
DEVIATOR STRESS AT % STRAIN, psi	18.4		
STRAIN AT PEAK DEVIATOR STRESS, %	6.3		
DEVIATOR STRESS AT 15% STRAIN, psi	13.6		
INITIAL DIAMETER, inch	2.888		
INITIAL HEIGHT, inch	6.300		
STRAIN RATE, %/minute	0.30		

CONTROLLED - STRAIN TEST

DESCRIPTION OF SPECIMENS: LEAN CLAY (CL), MOTTLED VERY DARK GRAYISH BROWN & VERY DARK GRAY

LL 30	PL 13	PI 17	Gs 2.7 EST.	SAMPLE TYPE: 3" SHELBY TUBE	TEST TYPE: UU

REMARKS:

PROJECT: WSEC ASH CONTAINMENT PONDS
COUNCIL BLUFFS, IA 05105087

BORING #: 4

SAMPLE #: 4

DEPTH, feet: 8 - 10

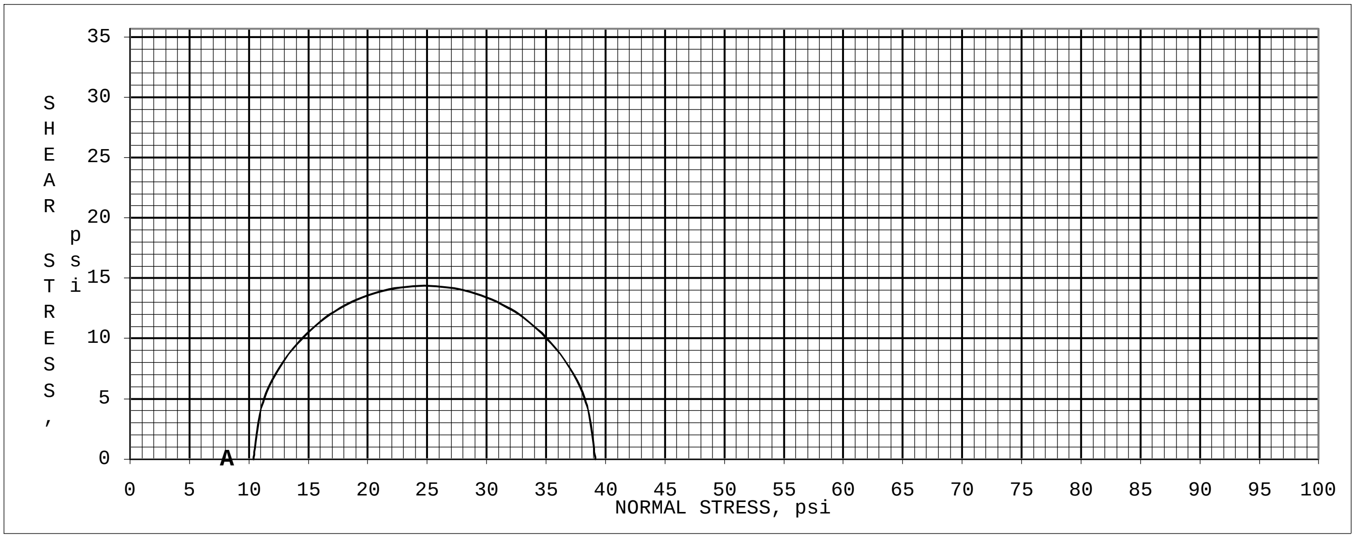
LABORATORY: TERRACON - OMAHA DATE: 9/30/2010

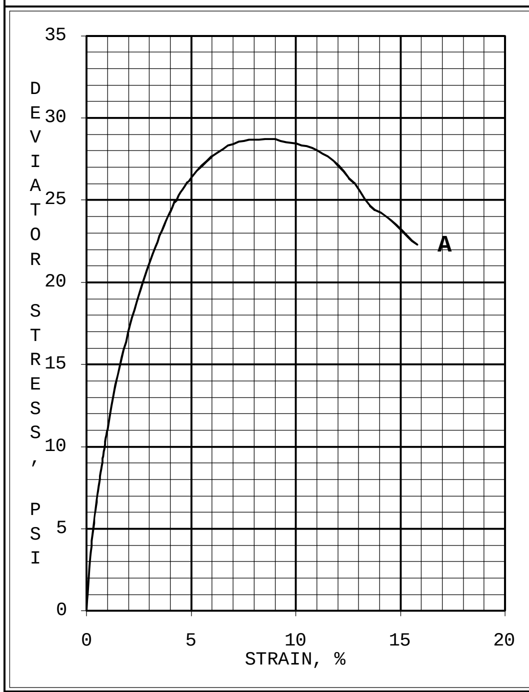
TRIAXIAL COMPRESSION TEST REPORT

PROCEDURE: ASTM D2850, UNCONSOLIDATED, UNDRAINED COMPRESSIVE STRENGTH OF COHESIVE SOILS IN TRIAXIAL COMPRESSION, MEMBRANE CORRECTION APPLIED. OTHER TESTS WERE CONDUCTED IN GENERAL ACCORDANCE WITH ASTMS D2216 AND D4318 IF APPLICABLE.

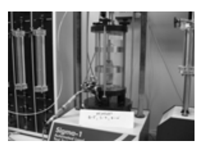
Terracon

N:\Projects\2010\05105087\Omaha Lab\UU\[05105087 UU B-4, S-4, 8-10' 9-30-10.xls]REPORT





SPECIMEN #:		A		
INITIAL	WATER CONTENT, % FROM TRIMMINGS	27.8		
INITIAL	DRY DENSITY, pcf	95.6		
INITIAL	SATURATION, %	98		
INITIAL	VOID RATIO	0.76		
WATER CONTENT, % AFTER SHEAR		27.3		



A B C

MINOR PRINCIPAL STRESS, psi	10.4
MOHR'S CIRCLES DRAWN AT % STRAIN	8.8
DEVIATOR STRESS AT % STRAIN, psi	28.7
STRAIN AT PEAK DEVIATOR STRESS, %	8.8
DEVIATOR STRESS AT 15% STRAIN, psi	23.2
INITIAL DIAMETER, inch	1.331
INITIAL HEIGHT, inch	2.917
STRAIN RATE, %/minute	0.30

CONTROLLED - STRAIN TEST

DESCRIPTION OF SPECIMENS: FAT CLAY (CH), VERY DARK GRAYISH BROWN

LL	PL	PI	Gs
52	21	31	2.7 EST.

SAMPLE TYPE: 3" SHELBY TUBE | TEST TYPE: UU

REMARKS:

PROJECT: WSEC ASH CONTAINMENT PONDS
COUNCIL BLUFFS, IA 05105087

BORING #: 5

SAMPLE #: 4

DEPTH, feet: 8 - 10

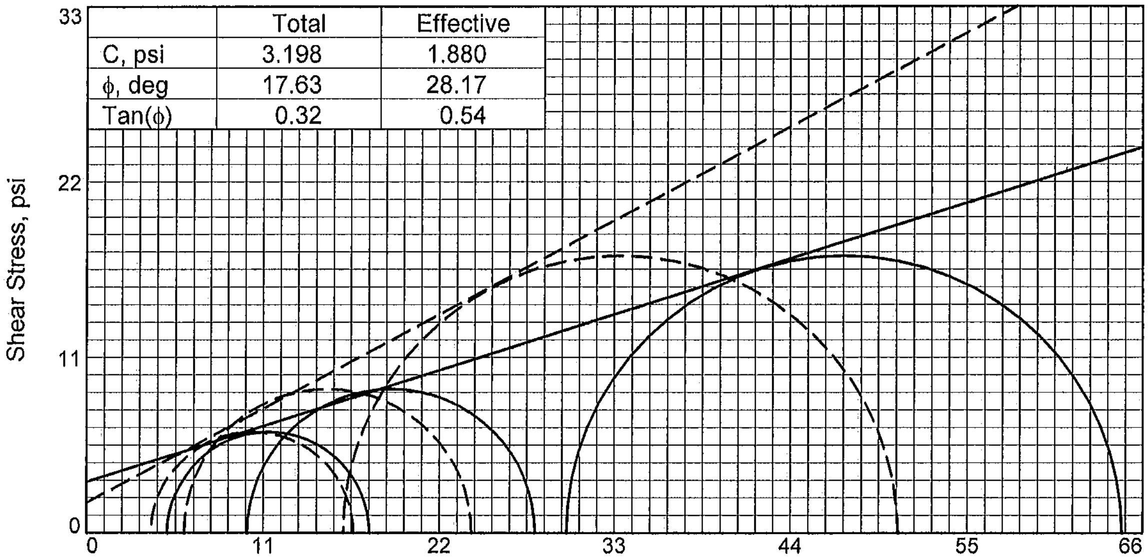
LABORATORY: TERRACON - OMAHA | DATE: 9/30/2010

TRIAXIAL COMPRESSION TEST REPORT

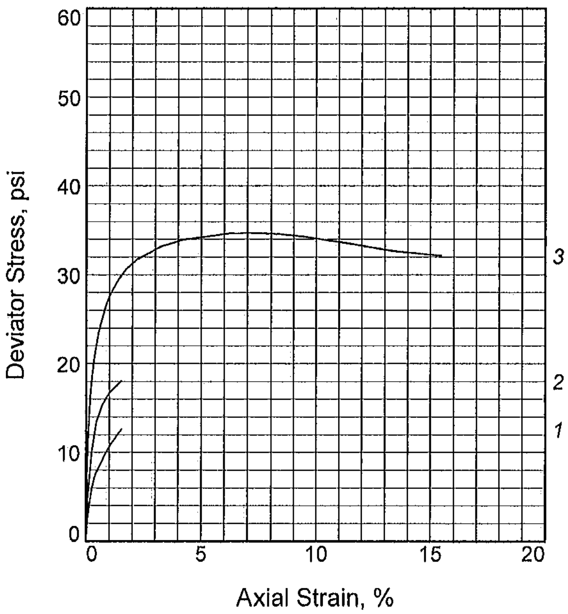
PROCEDURE: ASTM D2850, UNCONSOLIDATED, UNDRAINED COMPRESSIVE STRENGTH OF COHESIVE SOILS IN TRIAXIAL COMPRESSION, MEMBRANE CORRECTION APPLIED. OTHER TESTS WERE CONDUCTED IN GENERAL ACCORDANCE WITH ASTMS D2216 AND D4318 IF APPLICABLE.

Terracon

N:\Projects\2010\05105087\Omaha Lab\UU\[05105087 UU B-5, S-4, 8-10' 9-30-10.xls]REPORT



	Total	Effective
C, psi	3.198	1.880
ϕ, deg	17.63	28.17
Tan(ϕ)	0.32	0.54



Sample No.		1	2	3
Initial	Water Content, %	31.0	31.0	31.0
	Dry Density, pcf	91.8	91.8	91.8
	Saturation, %	98.7	98.7	98.7
	Void Ratio	0.8565	0.8565	0.8565
	Diameter, in.	2.875	2.875	2.875
	Height, in.	5.750	5.750	5.750
At Test	Water Content, %	31.0	30.9	30.8
	Dry Density, pcf	92.3	92.4	92.6
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.8468	0.8439	0.8409
	Diameter, in.	2.870	2.891	2.911
	Height, in.	5.740	5.649	5.561
Strain rate, in./min.		0.001	0.001	0.001
Back Pressure, psi		60.00	60.00	60.00
Cell Pressure, psi		65.00	70.00	90.00
Fail. Stress, psi		12.63	18.01	34.69
Total Pore Pr., psi		61.00	64.00	74.00
Ult. Stress, psi				
Total Pore Pr., psi				
$\bar{\sigma}_1$ Failure, psi		16.63	24.01	50.69
$\bar{\sigma}_3$ Failure, psi		4.00	6.00	16.00

Type of Test:
CU with Pore Pressures (Stage Loaded Sample)
Sample Type: ST
Description: DARK BROWN FAT CLAY

LL= 58 **PL=** 24 **PI=** 34
Assumed Specific Gravity= 2.73
Remarks: Lab No. 10131

Figure 1 of 2

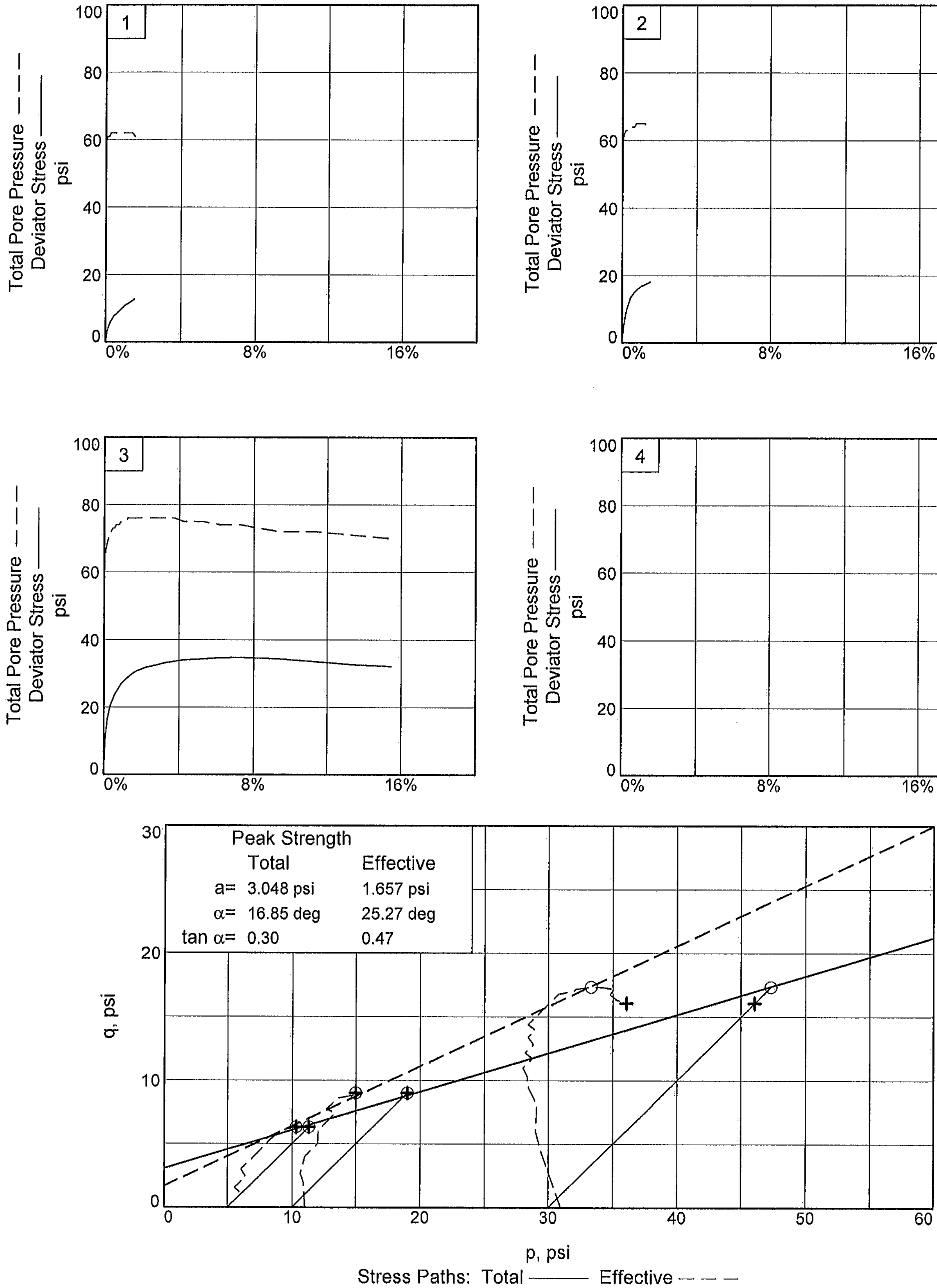
Client: HGM ASSOCIATES INC

Project: WSEC ASH CONTAINMENT PONDS

Source of Sample: B-2 **Depth:** 8-10'
Sample Number: ST/4
Proj. No.: 05105087 **Date Sampled:** 10-11-10

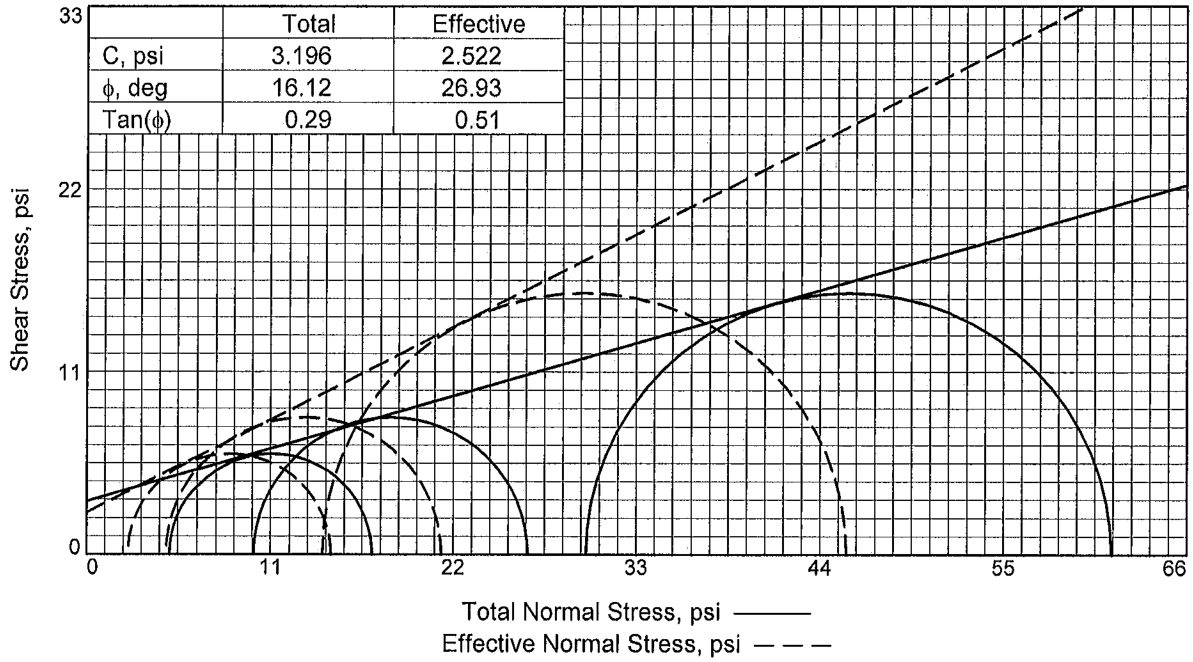
TRIAXIAL SHEAR TEST REPORT
H.C. Nutting
A Terracon Company

Tested By: FCE **Checked By:** GS

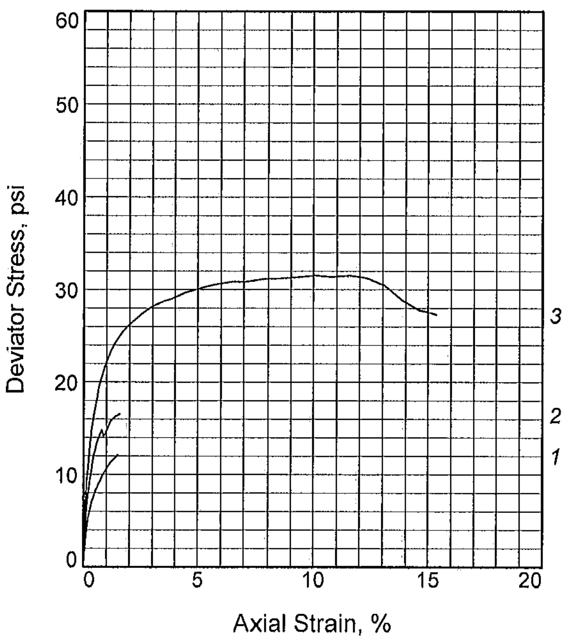


Client: HGM ASSOCIATES INC
Project: WSEC ASH CONTAINMENT PONDS
Source of Sample: B-2 **Depth:** 8-10' **Sample Number:** ST/4
Project No.: 05105087 **Figure** 2 of 2 **H.C. Nutting - A Terracon Company**

Tested By: FCE **Checked By:** GS



	Total	Effective
C, psi	3.196	2.522
ϕ, deg	16.12	26.93
Tan(ϕ)	0.29	0.51



	Sample No.	1	2	3
Initial	Water Content, %	27.2	27.2	27.2
	Dry Density, pcf	93.8	93.8	93.8
	Saturation, %	91.2	91.2	91.2
	Void Ratio	0.8101	0.8101	0.8101
	Diameter, in.	2.850	2.850	2.850
	Height, in.	5.697	5.697	5.697
At Test	Water Content, %	29.3	29.3	28.8
	Dry Density, pcf	94.5	94.6	95.3
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.7978	0.7958	0.7822
	Diameter, in.	2.843	2.864	2.880
	Height, in.	5.684	5.597	5.494
	Strain rate, in./min.	0.001	0.001	0.001
	Back Pressure, psi	60.00	60.00	60.00
	Cell Pressure, psi	65.00	70.00	90.00
	Fail. Stress, psi	12.10	16.50	31.50
	Total Pore Pr., psi	62.50	65.20	75.90
	Ult. Stress, psi			
	Total Pore Pr., psi			
	$\bar{\sigma}_1$ Failure, psi	14.60	21.30	45.60
	$\bar{\sigma}_3$ Failure, psi	2.50	4.80	14.10

Type of Test:
CU with Pore Pressures (Stage Loaded Sample)
Sample Type: ST
Description: DARK BROWN LEAN CLAY

LL= 47 **PL=** 19 **PI=** 28
Assumed Specific Gravity= 2.72
Remarks: Lab No. 10134

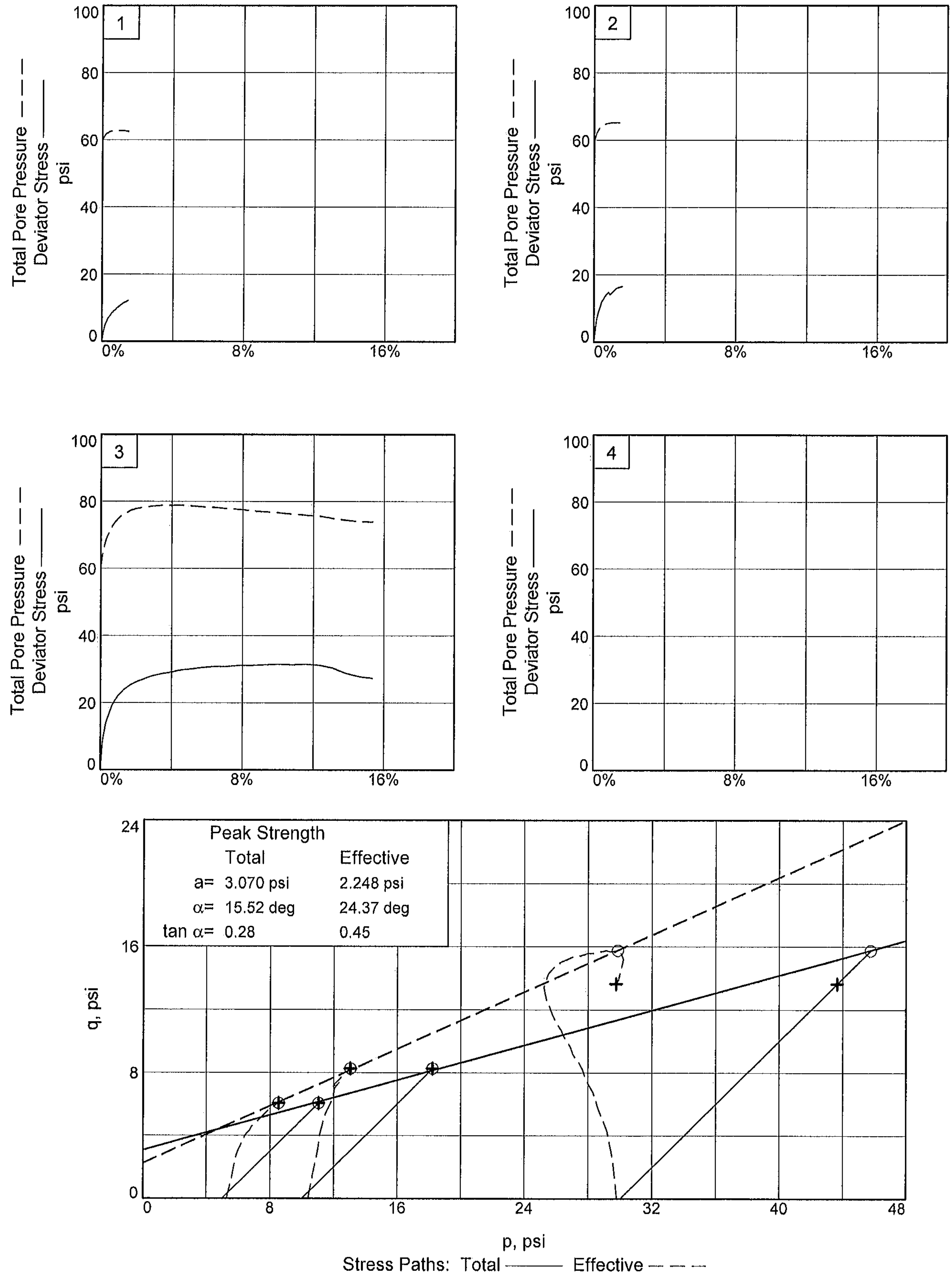
Figure 1 of 2

Client: HGM ASSOCIATES INC

Project: WSEC ASH CONTAINMENT PONDS

Source of Sample: B-5 **Depth:** 13-15'
Sample Number: ST/5
Proj. No.: 05105087 **Date Sampled:** 10-11-10

TRIAXIAL SHEAR TEST REPORT
H.C. Nutting
A Terracon Company



Client: HGM ASSOCIATES INC

Project: WSEC ASH CONTAINMENT PONDS

Source of Sample: B-5 **Depth:** 13-15' **Sample Number:** ST/5

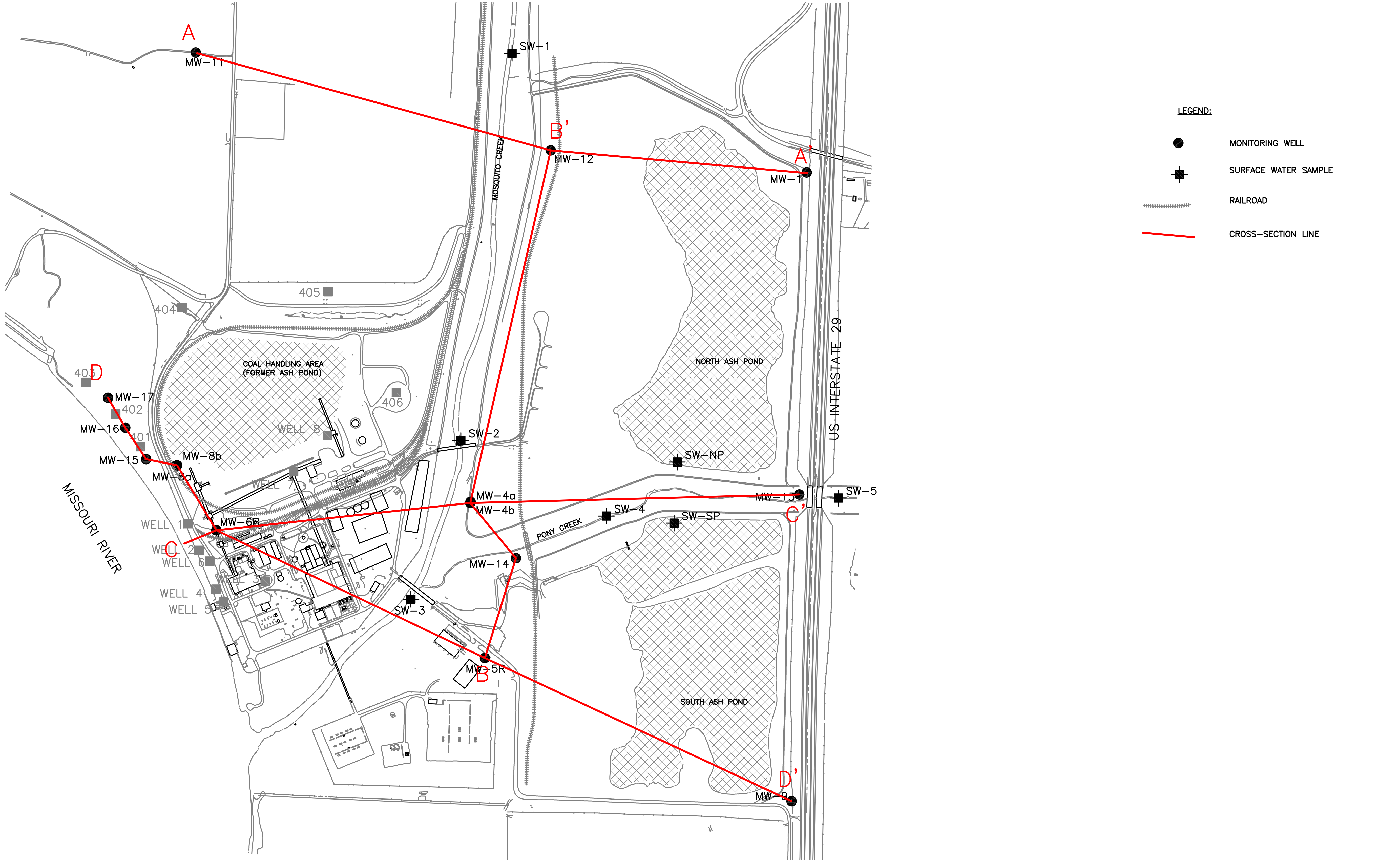
Project No.: 05105087 **Figure** 2 of 2

H.C. Nutting - A Terracon Company

Exhibit B-18

APPENDIX C

SUPPORTING DOCUMENTS



DESIGNED BY	ANGEL SHAWDA	
DRAWN BY	NORA DAY	
CHECKED BY	ANGEL SHAWDA	
APPROVED BY	KEVIN ARMSTRONG	
PROJECT MANAGER	KEVIN ARMSTRONG	

0 400 800
SCALE IN FEET

MANAGING OFFICE DES MOINES, IOWA

PROJECT MIDAMERICAN ENERGY COMPANY
WALTER SCOTT JR. ENERGY CENTER
COUNCIL BLUFFS, IOWA

TITLE **CROSS-SECTION MAP**

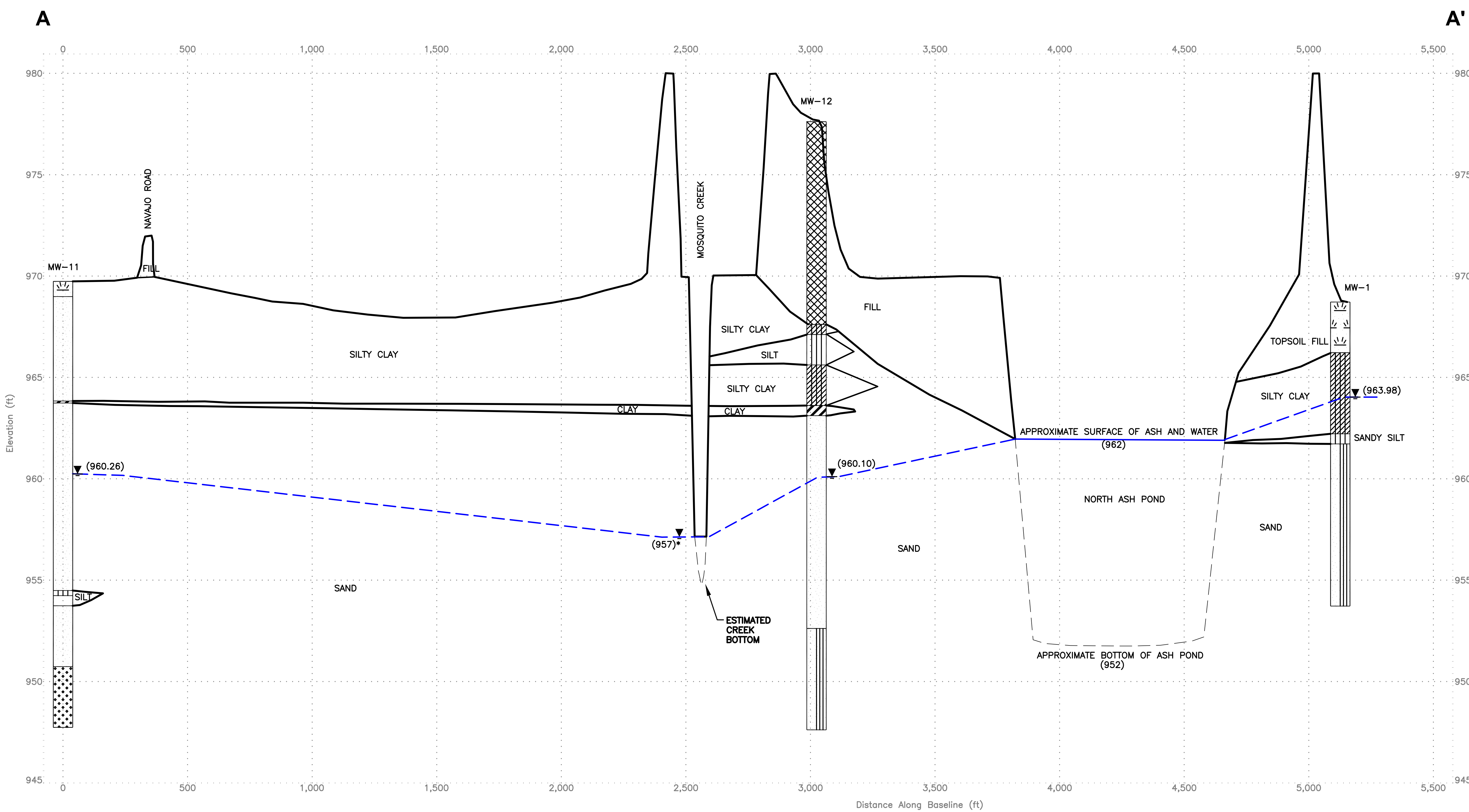
MWH

FIGURE 5

REVISION

FILE NAME

Exhibit C-4



ESTIMATED WATER TABLE (BASED ON SEASONAL HIGH CONDITIONS – AUGUST 4, 2008)

(957)* ESTIMATED CREEK LEVEL (BASED ON TOPOGRAPHIC SURVEY)

LITHOLOGY GRAPHICS

- Topsoil
- USCS High Plasticity Clay
- USCS Low Plasticity Silty Clay
- USCS Silt
- USCS Sandy Silt
- USCS Well–graded Sand
- USCS Poorly–graded Sand with Silt
- Fill (made ground)
- USCS Poorly–graded Sand

DESIGNED BY	ANGEL SHAWDA
DRAWN BY	DAVID MIRANDA
CHECKED BY	ANGEL SHAWDA
APPROVED BY	KEVIN ARMSTRONG
PROJECT MANAGER	KEVIN ARMSTRONG

MANAGING OFFICE: DES MOINES, IOWA

PROJECT: MIDAMERICAN ENERGY COMPANY
WALTER SCOTT JR. ENERGY CENTER
COUNCIL BLUFFS, IOWA

TITLE: **HYDROGEOLOGIC CROSS SECTION A-A'**

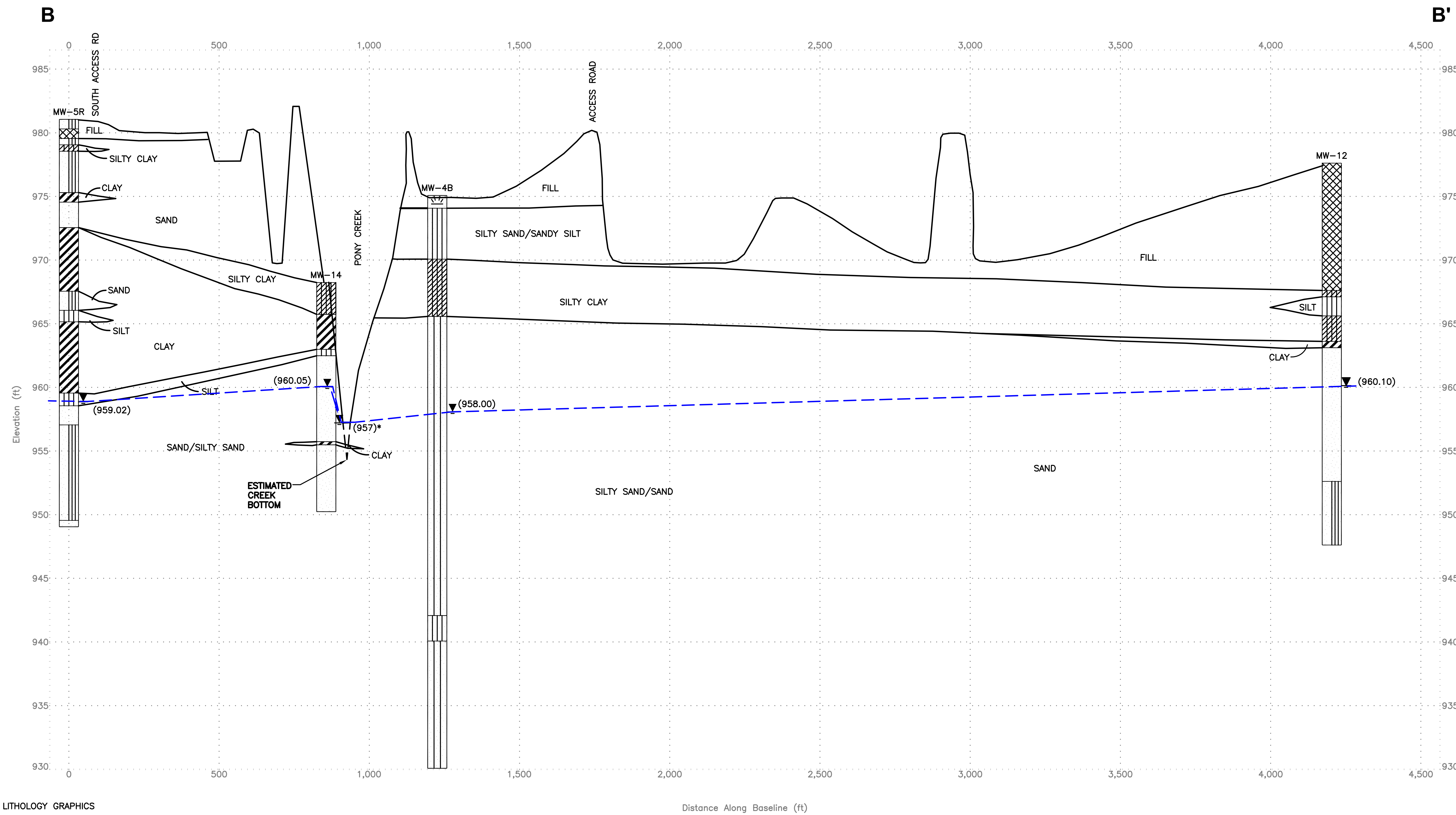
MWH

FIGURE 6

REVISION

FILE NAME

Exhibit C-5



LITHOLOGY GRAPHICS

- Fill (made ground)
- USCS Poorly-graded Sand with Silt
- USCS High Plasticity Clay
- USCS Low Plasticity Silty Clay
- Topsoil
- USCS Poorly-graded Sand
- USCS Silt
- USCS Sandy Silt
- USCS Silty Sand

ESTIMATED WATER TABLE (BASED ON SEASONAL HIGH CONDITIONS – AUGUST 4, 2008)

(957)* ESTIMATED CREEK LEVEL (BASED ON TOPOGRAPHIC SURVEY)

DESIGNED BY	ANGEL SHAWDA
DRAWN BY	DAVID MIRANDA
CHECKED BY	ANGEL SHAWDA
APPROVED BY	KEVIN ARMSTRONG
PROJECT MANAGER	KEVIN ARMSTRONG

MANAGING OFFICE: DES MOINES, IOWA

PROJECT: MIDAMERICAN ENERGY COMPANY WALTER SCOTT JR. ENERGY CENTER COUNCIL BLUFFS, IOWA

TITLE: HYDROGEOLOGIC CROSS SECTION B-B'

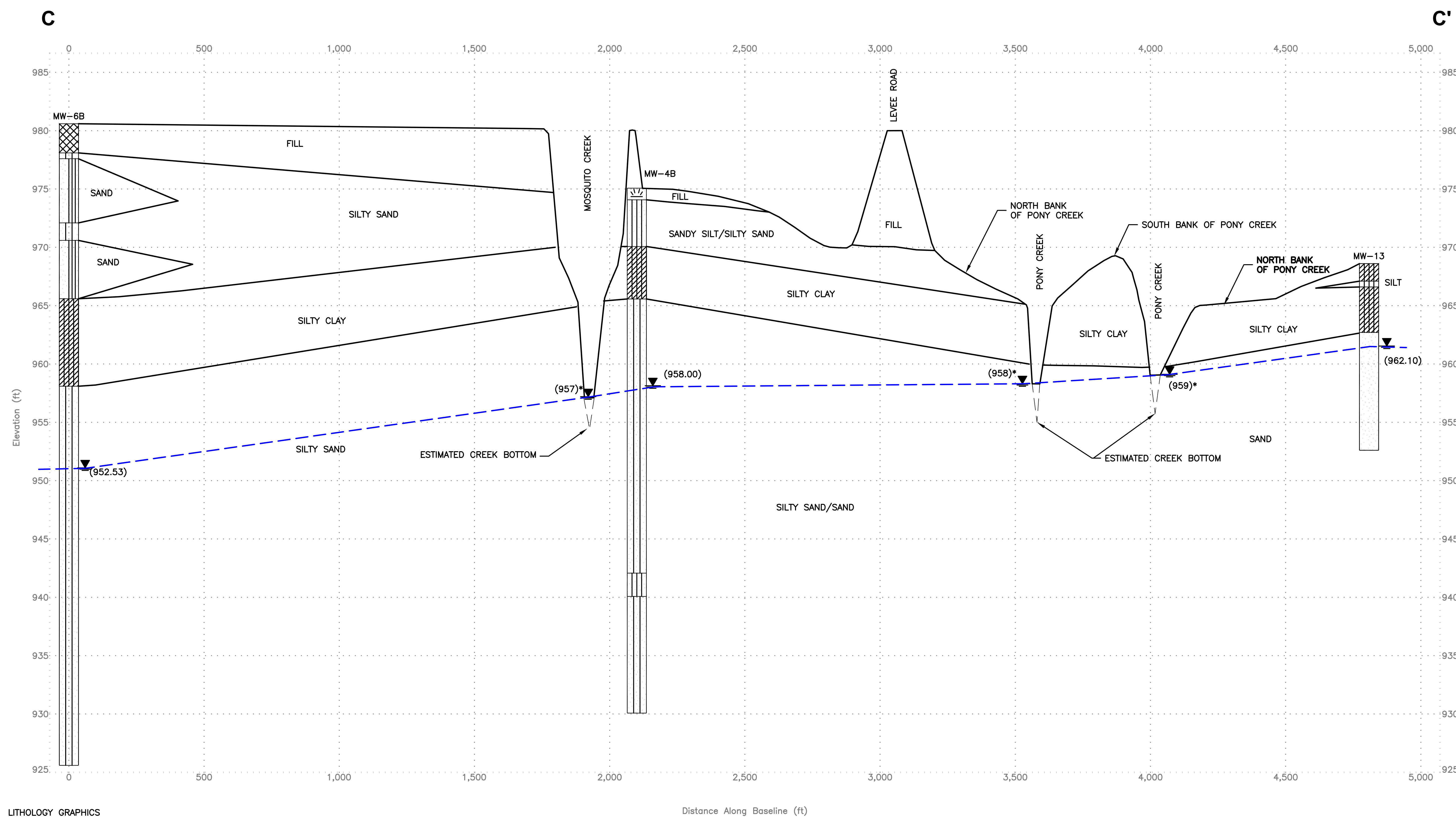
MWH

FIGURE 7

REVISION

FILE NAME

Exhibit C-6



LITHOLOGY GRAPHICS

- USCS Low Plasticity Silty Clay
- USCS Silty Sand
- Topsoil
- USCS Silt
- Fill (made ground)
- USCS Sandy Silt
- USCS Poorly-graded Sand
- USCS Poorly-graded Sand with Silt

ESTIMATED WATER TABLE (BASED ON SEASONAL HIGH CONDITIONS – AUGUST 4, 2008)

(957)* ESTIMATED CREEK LEVEL (BASED ON TOPOGRAPHIC SURVEY)

DESIGNED BY	ANGEL SHAWDA
DRAWN BY	DAVID MIRANDA
CHECKED BY	ANGEL SHAWDA
APPROVED BY	KEVIN ARMSTRONG
PROJECT MANAGER	KEVIN ARMSTRONG

MANAGING OFFICE: DES MOINES, IOWA

PROJECT: MIDAMERICAN ENERGY COMPANY
WALTER SCOTT JR. ENERGY CENTER
COUNCIL BLUFFS, IOWA

TITLE: HYDROGEOLOGIC CROSS SECTION C-C'

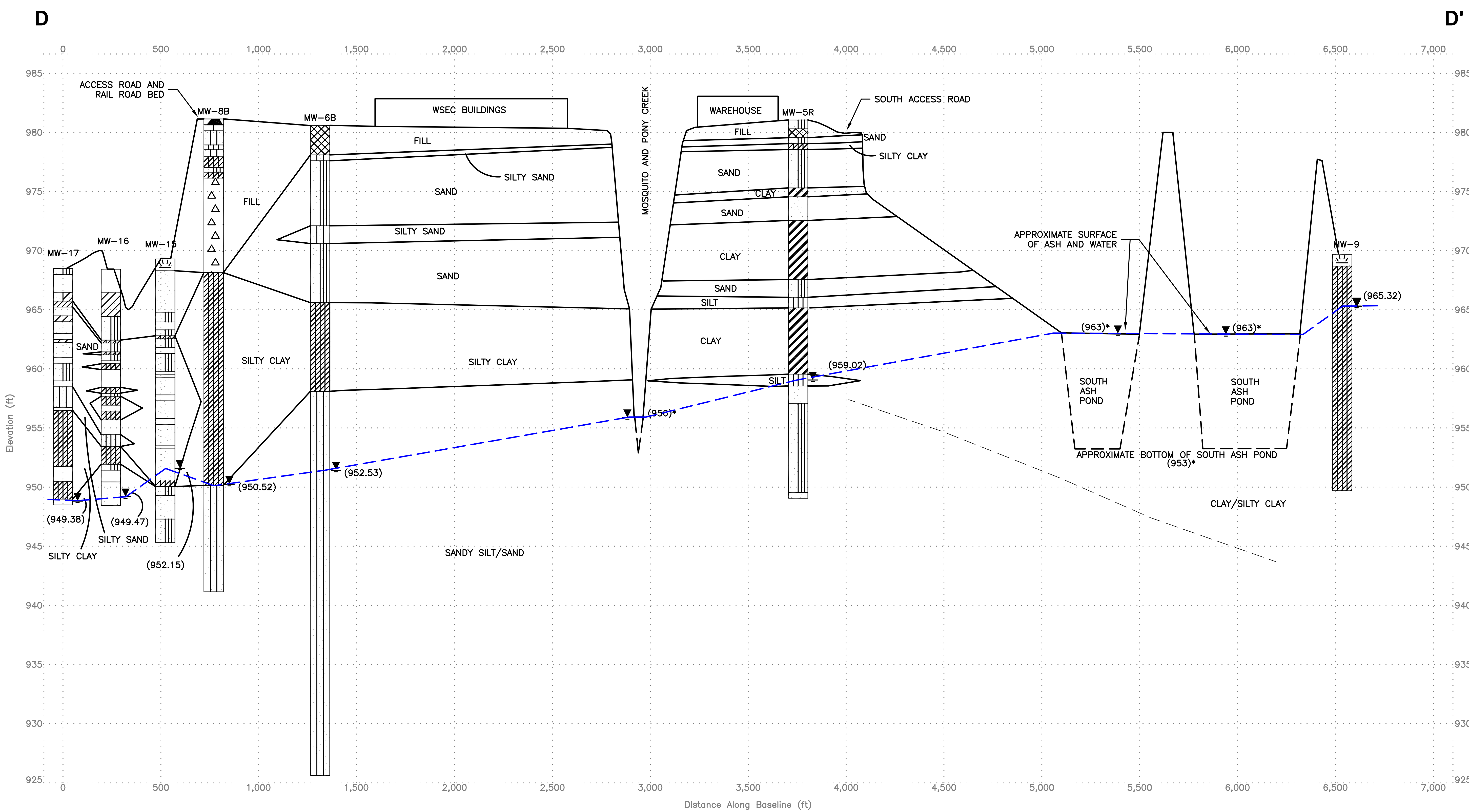
MWH

FIGURE 8

REVISION

FILE NAME

Exhibit C-7



LITHOLOGY GRAPHICS

- Topsoil
- USCS Sandy Silt
- USCS High Plasticity Clay
- USCS Poorly-graded Sand
- USCS Poorly-graded Sand with Clay
- USCS Silt
- USCS Poorly-graded Sand with Silt
- USCS Low Plasticity Clay
- Coal
- USCS Low Plasticity Silty Clay
- USCS Silty Sand
- Limestone
- USCS Clayey Sand
- Fill (made ground)
- Breccia
- ESTIMATED WATER TABLE (BASED ON SEASONAL HIGH CONDITIONS – AUGUST 4, 2008)
- (957)* ESTIMATED CREEK LEVEL (BASED ON TOPOGRAPHIC SURVEY)

DESIGNED BY	ANGEL SHAWDA
DRAWN BY	DAVID MIRANDA
CHECKED BY	ANGEL SHAWDA
APPROVED BY	KEVIN ARMSTRONG
PROJECT MANAGER	KEVIN ARMSTRONG

MANAGING OFFICE: DES MOINES, IOWA

PROJECT: MIDAMERICAN ENERGY COMPANY
WALTER SCOTT JR. ENERGY CENTER
COUNCIL BLUFFS, IOWA

TITLE: HYDROGEOLOGIC CROSS SECTION D-D'

MWH

FIGURE 9

REVISION

FILE NAME

Exhibit C-8

BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER	MW-1

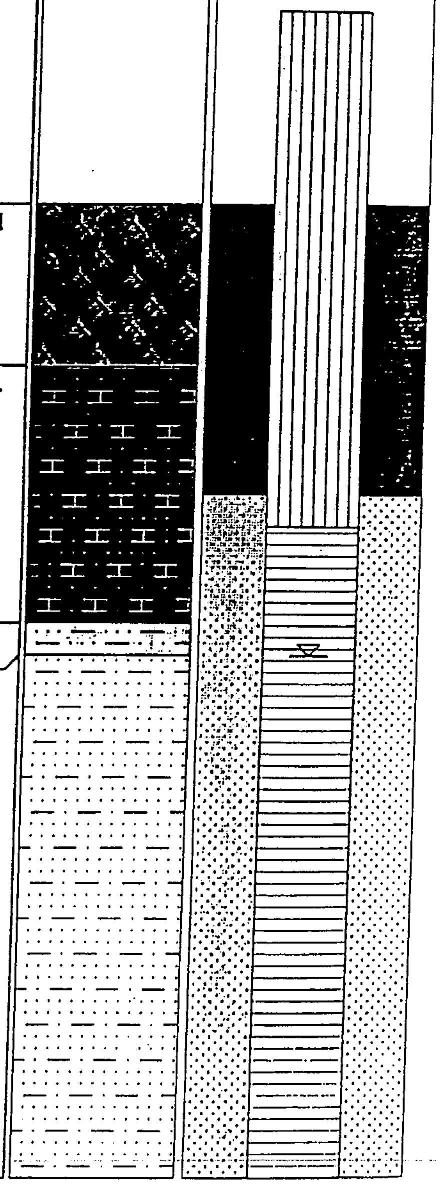
PROJECT NUMBER: MEC - Council Bluffs
PROJECT NAME: Ash Ponds Investigation
LOCATION: Council Bluffs, IA
DRILLING CO: Aquadrill
DRILLING METHOD: Hollow Stem Auger
FIELD PARTY: Auld, Dennis
GEOLOGIST: Eisen, Kevin
DATE BEGUN: 11/8/00 DATE COMPLETED: 11/8/00

FIELD BOOK NO: MEC - CB book 1
TOTAL DEPTH: 15'
GROUND SURFACE ELEVATION: 967.2'

STATIC WATER LEVEL (BGS)		
Depth (ft)		
Time		
Date		

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION
971.0							
970.0							
969.0							
968.0							
967.0							TOPSOIL: Brown silt/clay with roots and organics.
966.0			M				
965.0							
964.0							CLAY AND SILT: Tan/gray silt and clay.
963.0			M		-/-/100		
962.0							
961.0							
960.0			S		-/20/80		SANDY SILT: Tan/gray fine sandy silt.
959.0							SAND WITH SILT: Tan/gray fine sand with silt.
958.0					-/90/10		
957.0							
956.0							
955.0							
954.0					-/85/15		End of Boring at 15' bgs. Screened interval 5 - 15' bgs. Protective riser and expandable well cap installed.
953.0							

LITHOLOGY / WELL INSTALLATION



BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER: MW-4A

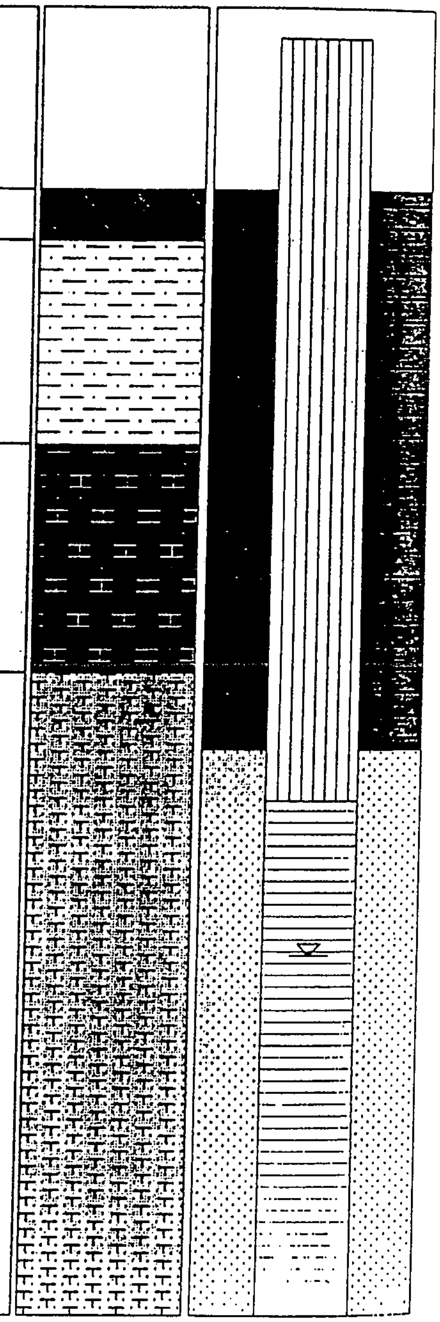
PROJECT NUMBER: MEC - Council Bluffs
PROJECT NAME: Ash Ponds Investigation
LOCATION: Council Bluffs, IA
DRILLING CO: Aquadrill
DRILLING METHOD: Hollow Stem Auger
FIELD PARTY: Auld, Dennis
GEOLOGIST: Eisen, Kevin
DATE BEGUN: 11/9/00 DATE COMPLETED: 11/10/00

FIELD BOOK NO: MEC - CB book 1
TOTAL DEPTH: 45'
GROUND SURFACE ELEVATION: 974.4'

STATIC WATER LEVEL (BGS)		
Depth (ft)		
Time		
Date		

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION
978.0							
977.0							
976.0							
975.0							
974.0							TOPSOIL: Brown silt with organics.
973.0			D/M				SILT WITH SAND: Tan/brown silt with 5-10% fine to coarse sand.
972.0							
971.0					-/5/95		
970.0			D				
969.0							CLAY AND SILT: Brown/gray silt and clay.
968.0							
967.0			M				
966.0							Low-medium plasticity.
965.0							
964.0					-/70/30		SILTY SAND: Tan very fine to fine silty sand.
963.0					-/40/60		6" sandy silt at 11' bgs.
962.0			M				
961.0							
960.0					-/80/20		
959.0			S				Water table at 15'.
958.0							
957.0							
956.0							
955.0							Pilot Boring advanced to 45' bgs. MW-4A is screened 12-22' bgs. MW-4A is 6' North of MW-4B. Protective riser and expandable well cap installed.
954.0							
953.0							

LITHOLOGY / WELL INSTALLATION



BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER: MW-4B

PROJECT NUMBER: MEC - Council Bluffs
PROJECT NAME: Ash Ponds Investigation
LOCATION: Council Bluffs, IA
DRILLING CO: Aquadrill
DRILLING METHOD: Hollow Stem Auger
FIELD PARTY: Auld, Dennis
GEOLOGIST: Eisen, Kevin
DATE BEGUN: 11/9/00 DATE COMPLETED: 11/10/00

FIELD BOOK NO: MEC - CB book 1
TOTAL DEPTH: 45'
GROUND SURFACE ELEVATION: 974.6'

STATIC WATER LEVEL (BGS)		
Depth (ft)		
Time		
Date		

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION	LITHOLOGY	WELL INSTALLATION
978.0									
977.0									
976.0									
975.0									
974.0							TOPSOIL: Brown silt with organics.		
973.0			D/M				SILT WITH SAND: Tan/brown silt with 5-10% fine to coarse sand.		
972.0									
971.0					-/5/95				
970.0			D						
969.0							CLAY AND SILT: Brown/gray silt and clay.		
968.0									
967.0			M						
966.0							Low-medium plasticity.		
965.0							SILTY SAND: Tan very fine to fine silty sand.		
964.0					-/70/30				
963.0					-/40/60		6" sandy silt at 11' bgs.		
962.0			M				MW-4A is screened 12-22' bgs.		
961.0									
960.0					-/80/20				
959.0			S				Water table at 15' bgs.		
958.0									
957.0									
956.0									

BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER: MW-4B

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION	LITHOLOGY	WELL CONSTRUCTION
955.0									
954.0			S						
953.0							As above. Tan silty fine sand.		
952.0					-/85/15				
951.0					-/80/20				
950.0									
949.0			S						
948.0									
947.0									
946.0					-/80/20				
945.0									
944.0			S						
943.0									
942.0					-/85/15				
941.0							SANDY SILT: Dark gray sandy silt with 5% gravel.		
940.0					5/15/80				
939.0			S				SILTY SAND: Tan/gray silty sand.		
938.0									
937.0							No recovery 35-40.		
936.0									
935.0									
934.0			S						
933.0									
932.0					-/80/20		2 silt lenses 1" thick each at 45' bgs.		
931.0							End of Pilot Boring at 45' bgs. MW-4B is screened 35-45' bgs. MW-4A is 6' North of MW-4B. Protective risers and expandable well caps installed on both.		
930.0									

Drilling Log

MWH

Monitoring Well **MW-5R**

Project	WSEC CCR Monofill
Owner	MidAmerican Energy Company
Location	18236 Applewood Rd, Council Bluffs, IA
Project Number	
Surface Elev.	981.05 ft
North	437777.012
East	998168.83
Top of Casing	981.05 ft
Water Level Initial	▽952.574 (03/17/08 15:55)
Static	▼952.644 (03/20/08 09:53)
Hole Depth	32.0ft
Screen: Diameter	2 in
Screen: Length	10.0 ft
Type/Size	PVC/0.01 in
Hole Diameter	8.0 in
Casing: Diameter	2 in
Casing: Length	22.0 ft
Type	PVC
Drill Co.	Thiele Geotech
Drilling Method	Hollow Stem Auger/24-inch split spoon
Driller	J. Carmen
Driller Reg. #	7801
Log By	A. Shawda
Start Date	3/17/2008
Completion Date	3/17/2008
Checked By	K. Armstrong

COMMENTS
Filter pack is Unimin 20/40 Filter Sil sand.
added during soil boring and well completion activities due to heavying sands.

Legend: Bentonite Grout · Bentonite Granules · Grout · Portland Cement · Sand Pack · Sand Pack

Depth (ft)	% Recovery	Blow Count Recovery	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Elevation (ft)
0 – 0.75	100%	5, 4	SP SM	Sandy silt/silty sand, light brown, loose, moist, 2.0 to 3.0 phi grain size, well sorted, subrounded, greater than 95% quartz.	981.054
0.75 – 1.5		3		Fill, limestone gravel, gravel is angular with varying diameters.	980
1.5 – 2.0		4	SP SM	Same as sandy silt/silty sand as 0 to 0.75 feet bgs.	
2.0 – 2.5		2	CL ML	Silty clay, olive gray, medium stiff, moist, medium plasticity.	
2.5 – 5.75	100%, 100%	5, 11, 14, 3, 6, 7, 7	SP SM	Sandy silt/silty sand, light brown to light gray, loose, moist, same as 1.5 to 2.0 feet bgs.	978, 976
5.75 – 6.5	100%	1	CH	Silty clay/clay, olive gray to dark gray, soft to crumbly, moist to dry, high plasticity.	
6.5 – 8.5	100%	9, 16, 25, 4	SP	Sand with minor silt, olive gray to yellowish orange, loose to medium dense, moist to dry, 1.5 to 2.5 phi grain size, well sorted, subrounded, sand composed of 95% quartz and 5% other rock fragments-black flecks with minor lignite banding.	974
8.5 – 10		4, 5, 11	CH	Clay, dark gray, very stiff, dry to moist, high plasticity, fine sand bands at approximately 9.5 ft to 9.9 ft bgs, sand bands are dark gray, 2.0 to 3.0 phi grain size, well sorted, and composed of greater than 95% quartz.	972
10 – 12	100%	2, 3, 6, 10	CH	Same as 8.5 to 10 feet bgs with 0.25 inch sand band at 11.25 feet bgs, very stiff to hard, dry to moist, with minor organic material composed of roots, wood, and etc.	970
12 – 12.75	100%	3	CH	Same as 10 to 12 feet bgs, but medium stiff.	
12.75 – 13.5		6, 10	CH	Same as 12 to 12.75 but hard to very stiff.	968
13.5 – 15	100%, 100%	14, 2, 9	SP SM	Sandy silt, dark gray, loose/crumbly, dry to moist, non-plastic, well sorted, 2.5 to 3.5 phi grain size, sand composed of greater than 95% quartz, straw inbedded.	

Continued Next Page

Drilling Log

MWH

Monitoring Well **MW-5R**

Project: *WSEC CCR Monofill* Owner: *MidAmerican Energy Company*

Location: *18236 Applewood Rd, Council Bluffs, IA* Project Number:

Continued

Depth (ft)	USCS	Description (Color, Moisture, Texture, Structure, Odor) — Geologic Descriptions are Based on the USCS.
15–15.9	ML	Silt, dark gray, loose/crumbly, dry, non-plastic.
15.9–21.5	CH	Clay, dark gray, soft, moist, high plasticity, still has pieces of straw embedded.
		Clay, light gray with light brown veining grading to light brown color with light gray mottles, medium stiff to soft with depth, moist, high plasticity
		Same light brown clay, but no mottles, getting softer with depth, moist to wet at 20 ft with trace of 2.5 to 3.5 phi sand, sand composed of greater than 95% quartz.
		Clay, light gray with light brown mottles, soft, moist, high plasticity.
21.5–22.5	ML	Silt with trace sand, light gray to olive gray, loose/crumbly, moist, no plasticity.
22.5–24	SP	Sand, yellowish orange, loose, moist to dry, 2.5 to 3.5 phi grain size, well sorted, subrounded, sand composed of greater than 95% quartz and 5% other rock fragments - black flecks.
24–31.5	SP SM	Same as 22.5 to 24 but wet at approximately 25 ft bgs, minor silt matrix.
		Sand, light brown, wet, same as 25 to 26 ft bgs.
		Same as 26 to 28 ft bgs, sand with silt, wet, 1.5 to 2.5 phi grain size, well sorted, black flecks-lignite.
31.5–32	SP	Sand, olive gray to dark gray, loose, wet, 1.0 to 2.0 phi grain size, well sorted, subrounded, sand composed of 95% quartz and 5% rock fragments - black flecks.
		End of boring = 32 feet bgs.

Sample interval (ft)	% Recovery	Blow Count Recovery
to 16	100%	13, 9
16–18	100%	2, 3, 5, 6
18–20	100%	1, 2, 2, 3
20–22	100%	0, 2, 2, 3
22–24	100%	1, 6, 9, 9
24–26	75%	3, 5, 5, 8
26–28	100%	2, 5, 5, 7
28–30	100%	1, 2, 3, 5
30–32	100%	1, 3, 7, 10

Elevation (ft): 966, 964, 962, 960, 958, 956, 954, 952, 950, 948

Drilling Log CBEC HIR 08-2006 SOUTH.GPJ MWH IA.GDT 2/25/09

BORING AND WELL CONSTRUCTION LOG

BOREHOLE NUMBER: MW-9

PROJECT NUMBER: MEC - Council Bluffs
PROJECT NAME: Ash Ponds Investigation
LOCATION: Council Bluffs, IA
DRILLING CO: Aquadrill
DRILLING METHOD: Hollow Stem Auger
FIELD PARTY: Auld, Dennis
GEOLOGIST: Eisen, Kevin
DATE BEGUN: 11/10/00 DATE COMPLETED: 11/10/00

FIELD BOOK NO: MEC - CB book 1
TOTAL DEPTH: 20'
GROUND SURFACE ELEVATION: 968.7'

STATIC WATER LEVEL (BGS)		
Depth (ft)		
Time		
Date		

ELEVATION	SAMPLES	SAMPLE NUMBER	MOISTURE	CONSISTENCY	G/S/F (%)	ORGANIC VAPOR	DESCRIPTION
972.0							
971.0							
970.0							
969.0							
968.0			M				TOPSOIL: Brown/gray silt and clay with organics.
967.0							CLAY AND SILT: Gray clay/silt.
966.0							
965.0			M		-/-/100		Minor organics in top 2' of unit (to 3' bgs).
964.0							
963.0							Water table (stablized) at 5.5' bgs.
962.0					-/-/100		Low plasticity.
961.0							
960.0					-/5/95		5% very fine sand in matrix.
959.0					-/-/100		
958.0			S		-/70/30		1/2" thick silty sand seam at 11' bgs.
957.0					-/-/100		CLAY AND SILT: Tan/gray silt/clay.
956.0							
955.0							
954.0							
953.0					-/-/100		
952.0			S		-/70/30		1/4" thick silty sand seam at 16.5' bgs.
951.0							
950.0					-/-/100		End of Boring at 20' bgs. Screened interval 3.5 - 13.5' bgs. Protective riser and expandable well cap installed.
949.0							

LITHOLOGY / WELL INSTALLATION

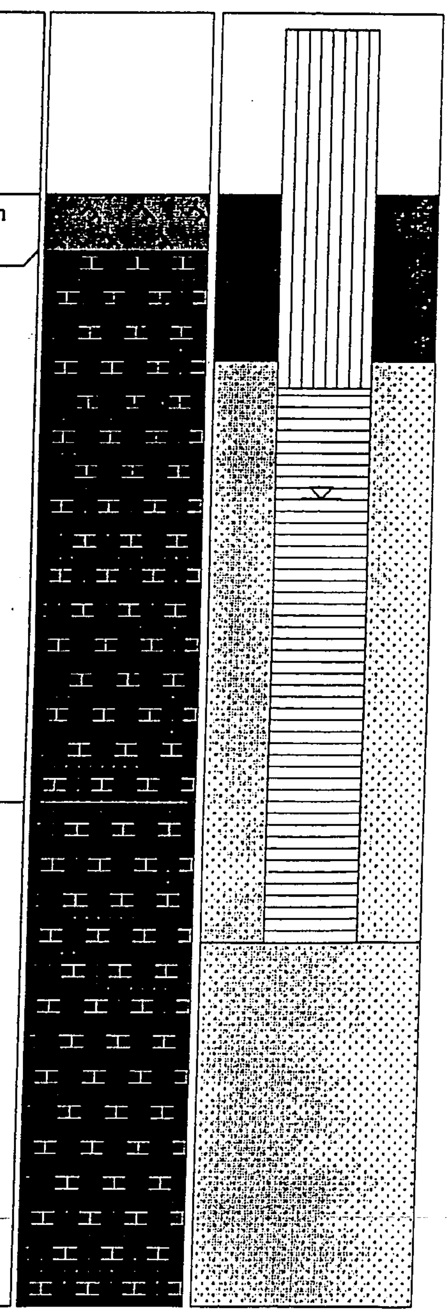


Exhibit C-15

Drilling Log

MWH

Monitoring Well **MW-12**

Project: WSEC CCR Monofill
Owner: MidAmerican Energy Company
Location: 18236 Applewood Rd, Council Bluffs, IA
Project Number:
Surface Elev.: 977.62 ft
North: 441957.079
East: 998711.403
Top of Casing: 980.50 ft
Water Level Initial: ▽957.612 (03/18/08 15:10)
Static: ▼957.612 (03/18/08 15:10)
Hole Depth: 30.0ft
Screen: Diameter: 2 in
Length: 10.0 ft
Type/Size: PVC/0.01 in
Hole Diameter: 8.0 in
Casing: Diameter: 2 in
Length: 20.0 ft
Type: PVC
Drill Co.: Thiele Geotech
Drilling Method: Hollow Stem Auger/24-inch split spoon
Driller: J. Carmen
Driller Reg. #: 7801
Log By: A. Shawda
Start Date: 3/18/2008
Completion Date: 3/18/2008
Checked By: K. Armstrong

COMMENTS
Filter pack is Unimin 20/40 Filter Sil sand.

Legend: Bentonite Grout, Bentonite Granules, Grout, Portland Cement, Sand Pack, Sand Pack

Depth (ft)	None (ppm)	% Recovery	Blow Count Recovery	USCS
0–2		100%	13, 17, 8, 9	
2–4		100%	6, 43, 29, 13	
4–6		100%	16, 11, 10, 28	
6–8		100%	6, 7, 19, 4	
8–10		100%	1, 3, 4, 3	
10–12		100%	1, 4, 9, 4	CL ML / ML
12–14		75%	2, 3, 4, 5	CL ML
14–16		100%	1, 4, 7, 10	CH / SP
16–18		100%	3, 8, 9, 15	SP
18–20		100%	8, 11, 13, 18	SP

USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.
	Fill, yellowish orange and light brown, hard, dry, crumbly, no plasticity.
	Fill, dark gray to olive gray with greenish gray mottles, hard, dry, crumbly, no plasticity.
	Fill/silt, yellowish orange to light brown, loose, dry, crumbly, no plasticity.
	Same as 3.75 to 4.5 but light brown.
	Fill, dark gray to olive gray, hard crumbly, no plasticity.
	Fill, yellowish brown, loose, dry, no plasiticy.
	Fill, dark gray, looe, dry, no plasticity.
	Silty clay/fill mix, greenish gray, moist, no plasticity.
CL ML	Silty clay to silt, light gray, soft, moist, no plasticity.
ML	Silt, light gray, crumbly, moist to dry with depth, no plasticity.
CL ML	Silty clay, light brown, soft to medium stiff, moist, low plasticity. At 14ft bgs, clay to silty clay, light brown to dark gray, medium stiff to stiff, dry to moist, medium plasticity.
CH	Clay, dark gray to light brown, soft, moist, high plasticity.
SP	Sand, yellowish orange, loose, dry, 2.0-3.0 phi grain size, well sorted, subrounded, sand composed of greater than 95% quartz and less than 5% other rock fragments - black flecks.
	Same sand as 14.5ft to 16.0 ft bgs, grading to yellowish orange to light brown with slight moisture at 17.75ft to 18 feet bgs.
	Same sand, increasing moisture with depth - moist to wet at 20 ft bgs, also increase in grain size to 1.5 to 2.5 phi.

Well Completion

Elevation (ft): 977.617, 976, 974, 972, 970, 968, 966, 964, 962, 960, 958

Continued Next Page

Drilling Log CBEC HIR 08-2006 SOUTH.GPJ MWH IA.GDT 2/25/09

Drilling Log

Monitoring Well **MW-12**

Project: *WSEC CCR Monofill* Owner: *MidAmerican Energy Company*

Location: *18236 Applewood Rd, Council Bluffs, IA* Project Number:

Depth (ft)	None (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
						Continued		
20			2, 7, 11, 12			Same sand, moist to wet.		
22		100%	1, 4, 4, 4		SP	Sand, light brown to olive gray, loose, wet, 1.5 to 2.5 phi grain size, well sorted, subrounded, sand composed of 95% quartz and 5% other rock fragments - black flecks.		956
24		100%	1, 3, 3, 5			Sand, olive gray, loose to medium dense, wet, 1.5 to 2.5 phi grain size, well sorted, subrounded, sand composed of 95% quartz and 5% rock fragments - black flecks.		954
26		100%	2, 2, 5, 6		SP SM	Silty sand/sand silt, olive gray to dark gray, loose to medium dense, wet, 2.0 to 3.0 phi grain size, well sorted, sand composed of 90% quartz and 10% rock fragments - black flecks, no plasticity.		952
28		100%	3, 6, 6, 8					950
30		100%						948
						End of boring = 30 feet bgs.		
32								946
34								944
36								942
38								940
40								938
42								936
44								934
46								932

Drilling Log CBEC HIR 08-2006 SOUTH.GPJ MWH IA.GDT 2/25/09

Drilling Log

MWH

Monitoring Well **MW-13**

Project: WSEC CCR Monofill
Owner: MidAmerican Energy Company
Location: 18236 Applewood Rd, Council Bluffs, IA
Project Number:
Surface Elev.: 968.61 ft
North: 439123.389
East: 1000757.67
Top of Casing: 971.50 ft
Water Level Initial: ▽961.154 (03/19/08 11:14)
Static: ▼
Hole Depth: 16.0ft
Screen: Diameter: 2 in
Length: 10.0 ft
Type/Size: PVC/0.01 in
Hole Diameter: 8.0 in
Casing: Diameter: 2 in
Length: 6.0 ft
Type: PVC
Drill Co.: Thiele Geotech
Drilling Method: Hollow Stem Auger/24-inch split spoon
Driller: J. Carmen
Driller Reg. #: 7801
Log By: A. Shawda
Start Date: 3/19/2008
Completion Date: 3/19/2008
Checked By: K. Armstrong

COMMENTS
Filter pack is Unimin 20/40 Filter Sil sand.

Legend: Bentonite Grout, Bentonite Granules, Grout, Portland Cement, Sand Pack, Sand Pack

Depth (ft)	None (ppm)	% Recovery	Blow Count Recovery	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Elevation (ft)
0–2		100%	5, 7, 13, 13	CL ML	Silt to silty clay, light brown with organic material, loose to soft and crumbly, moist, low to no plasticity, roots and etc. Same as 0-0.5 feet but dry.	968.606, 968
1.5–2				ML	Silt, light gray, crumbly, moist to dry, no plasticity, organic matter, roots and etc.	
2–5.9		100%, 100%	6, 8, 8, 10; 1, 1, 2, 3	CL ML	Silty clay, light brown to olive gray, soft to crumbly, moist, low plasticity.	966, 964
5.9–14		100%, 100%, 100%, 100%	2, 4, 5, 8; 3, 4, 4, 3; 1, 2, 3, 4; 1, 3, 5, 6	SP	Sand, yellowish orange to light brown, loose, dry to moist, 1.5 to 2.5 phi grain size, well sorted, subrounded, sand composed of greater than 95% quartz and less than 5% rock fragments -black lignite flecks. Same sand as 5.9-6.0 ft bgs, with 6 ft to 7 ft bgs moist, 7 ft to 7.5 ft bgs moist to wet, and 7.5 to 7.75 ft bgs wet. Same wet sand as 7.5 to 7.75 feet bgs with red rock fragments as well as black flecks, lignite layer/band at 14 ft bgs.	962, 960, 958, 956
14–16		100%	1, 4, 8, 16	SP	Same wet sand as 8-14 feet but increase in lignite flecks - very few red flecks and color olive gray, sand composed of 90% quartz and 10% other rock fragments - lignite flecks.	954
16					End of boring = 16 feet bgs.	952, 950

Drilling Log

Monitoring Well **MW-14**

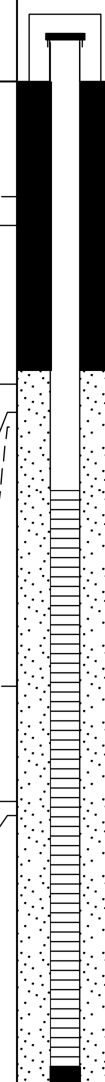
Page: 1 of 1

Project	WSEC CCR Monofill	Owner	MidAmerican Energy Company
Location	18236 Applewood Rd, Council Bluffs, IA	Project Number	
Surface Elev.	968.24 ft	North	438598.96
East	998425.105		
Top of Casing	971.18 ft	Water Level Initial	▽957.211 (03/19/08 17:00)
Static	▼		
Hole Depth	18.0ft	Screen: Diameter	2 in
Length	10.0 ft	Type/Size	PVC/0.01 in
Hole Diameter	8.0 in	Casing: Diameter	2 in
Length	7.5 ft	Type	PVC
Drill Co.	Thiele Geotech	Drilling Method	Hollow Stem Auger/24-inch split spoon
Driller	J. Carmen	Driller Reg. #	7801
Log By	A. Shawda		
Start Date	3/19/2008	Completion Date	3/19/2008
Checked By	K. Armstrong		

COMMENTS
Filter pack is Unimin 20/40 Filter Sil sand.

Legend: Bentonite Grout, Bentonite Granules, Grout, Portland Cement, Sand Pack, Sand Pack

Depth (ft)	None (ppm)	% Recovery	Blow Count Recovery	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Elevation (ft)
0–2		75%	2, 2, 4, 5	CL ML	Silt/silty clay, light brown, stiff to very stiff, moist to wet from 0.0 ft to 0.5 ft bgs and then moist, medium to low plasticity, organic materials - roots, grass, and etc.	968.239
2–4		75%	1, 3, 6, 7		Silty clay, light brown, soft, moist, medium plasticity, few roots.	966
				CH	Clay, light gray, very stiff, moist, roots.	
4–6		100%	1, 3, 4, 7	ML	Silt with minor fine sand, light brown to yellowish orange, soft, wet, no plasticity.	964
6–8		100%	5, 7, 7, 11	SP	Sand, yellowish orange, loose, dry to moist, 2.5 to 3.5 phi grain size, well sorted, subrounded, sand composed of greater than 95% quartz and less than 5% rock fragments - black flecks and reds.	962
8–10		100%	5, 6, 6, 5		Sand, yellowish orange to light gray, loose, dry to slightly moist with increased moisture at 8 ft bgs, 2.5 to 3.5 phi grain size, sand composed of greater than 95% quartz and less than 5% rock fragments - black flecks and reds.	960
10–12		100%	1, 2, 3, 4	SP	Sand, light brown to yellowish orange, loose, wet, 2.0 to 3.0 phi grain size, well sorted, subrounded, sand composed of 95% quartz and 5% rock fragments - black flecks.	958 ▽
12–14		100%	2, 4, 5, 7	CH	Clay, light gray, stiff to medium stiff, wet, high plasticity.	956
				SP	Sand, light brown to yellowish orange, loose, wet, 2.0 to 3.0 phi grain size, well sorted, subrounded, sand composed of 95% quartz and 5% rock fragments - black flecks.	
14–16		100%	3, 6, 8, 11			954
16–18		100%	3, 6, 6, 27			952
18–20					End of boring = 18 ft bgs.	950



GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon – 1-$^3/_8$" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube - 3" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the “Standard Penetration” or “N-value”.

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	N/E:	Not Encountered
WCI:	Wet Cave in	WD:	While Drilling		
DCI:	Dry Cave in	BCR:	Before Casing Removal		
AB:	After Boring	ACR:	After Casing Removal		

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	0-1	Very Soft
500 – 1,000	2-4	Soft
1,001 – 2,000	4-8	Medium Stiff
2,001 – 4,000	8-15	Stiff
4,001 – 8,000	15-30	Very Stiff
8,000+	> 30	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Ring Sampler (RS) Blows/Ft.	Relative Density
0 – 3	0-6	Very Loose
4 – 9	7-18	Loose
10 – 29	19-58	Medium Dense
30 – 49	59-98	Dense
> 50	> 99	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other Constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other Constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifiers	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	> 30

Reliable ■ Responsive ■ Convenient ■ Innovative

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification: Group Symbol	Soil Classification: Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]	GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]	SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G,H,I]
			Fines Classify as CL or CH	SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]	CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OL	Organic clay [K,L,M,N]
					Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K,L,M]
			PI plots below "A" line	MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OH	Organic clay [K,L,M,P]
					Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains $\geq$ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains $\geq$ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains $\geq$ 30% plus No. 200 predominantly sand, add "sandy" to group name.

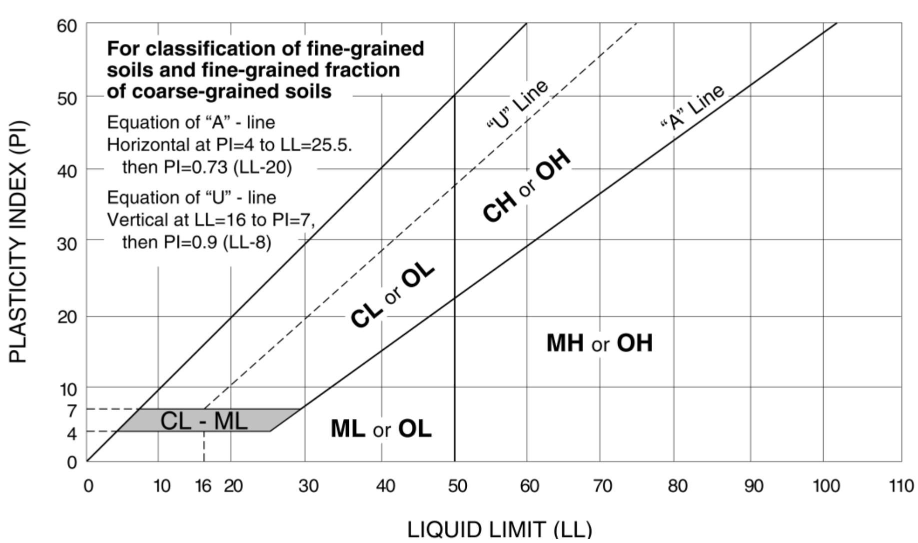
[M] If soil contains $\geq$ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI $\geq$ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



References

Soil Survey of Pottawattamie County, Iowa; United States Department of Agriculture; accessed via the NRCS web site at http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

Pottawattamie County GIS Mapping Website, accessed via http://gis3.pottcounty.com/giswebsite/

Engineering and Design – Design and Construction of Levees, Manual No. 1110-2-1913, U.S. Army Corps of Engineers, Washington, D.C., April, 2000

Engineering and Design – Slope Stability, Manual No. 1110-2-1902, U.S. Army Corps of Engineers, Washington, D.C., October, 2003

APPENDIX D

Slope Stability Analyses

fb: hgm: \\Srv13\data\WSEC\WSEC BERM STABILITY\dwg\EXHIBIT.dwg

project no.

sheet 1 OF 1

project WSEC IPOUNDMENT PONDS
BERM STABILITY

client MIDAMERICAN ENERGY COMPANY
7215 NAVAJO STREET, COUNCIL BLUFFS, IOWA 51501

sheet EXHIBIT

DEF drawn		
DEF designed		
TLS approved		
SEPT.'10 date	revision	date

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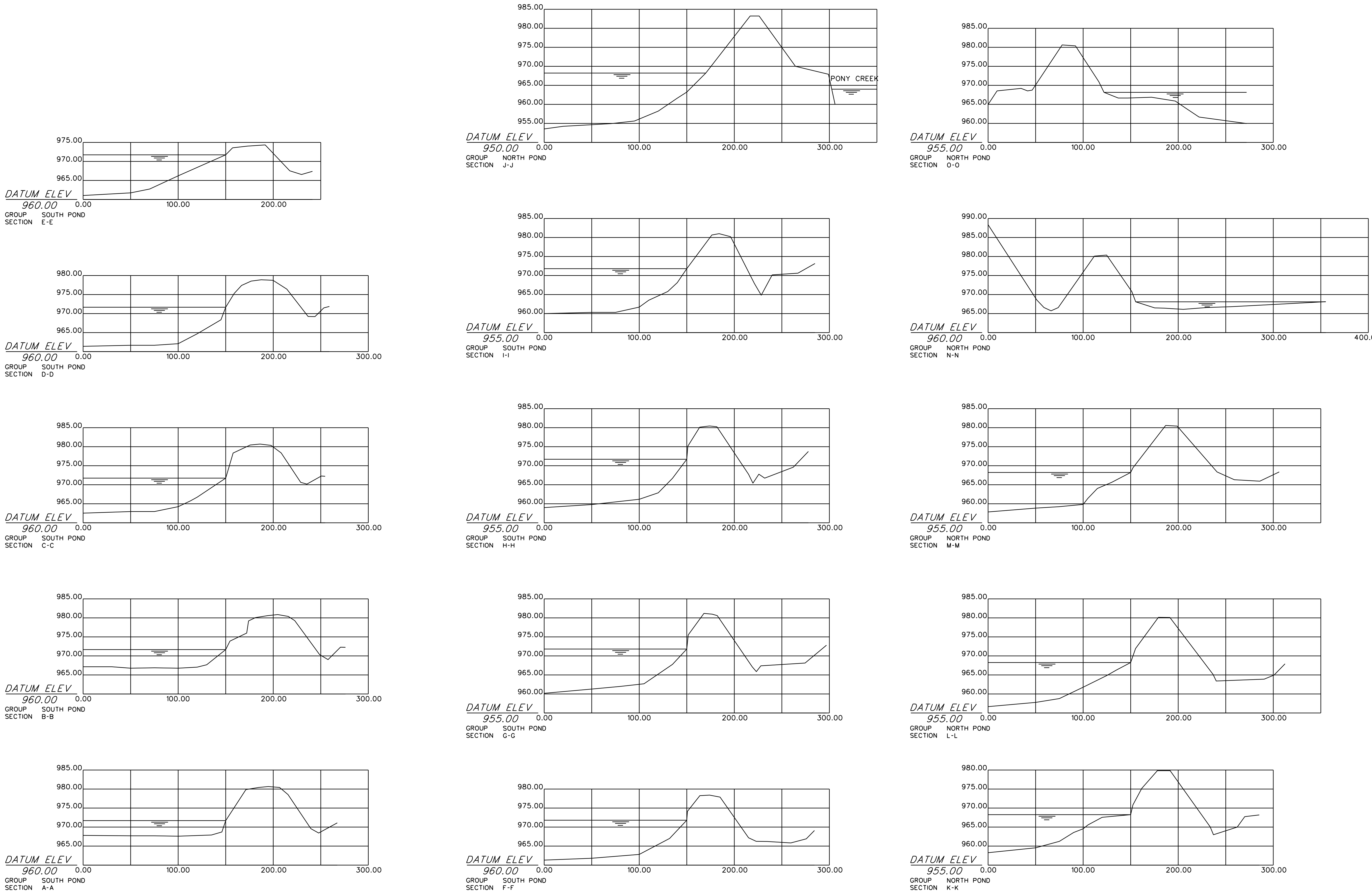
Exhibit D-1



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PHONE: (712) 323-0530

LAL drawn
designed
TLS approved
SEP. 10 date
revision
date

project WSEC IMPOUNDMENT PONDS
BERM STABILITY

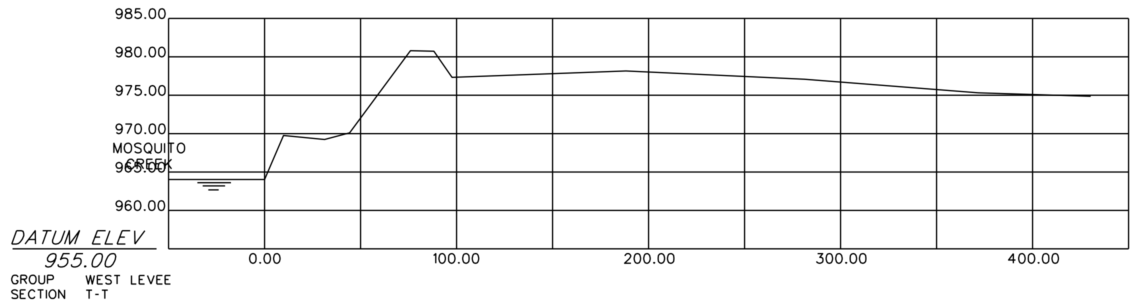
client MID AMERICAN ENERGY COMPANY

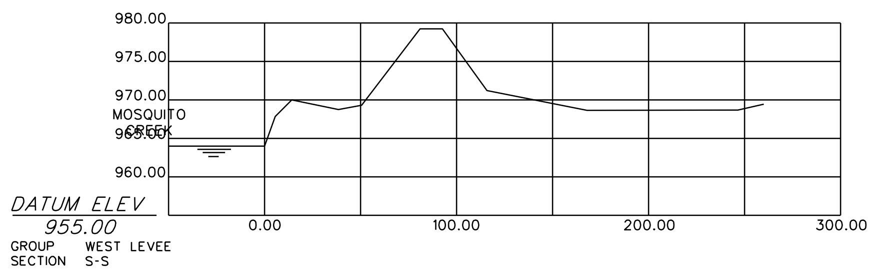
sheet POND CROSS SECTIONS

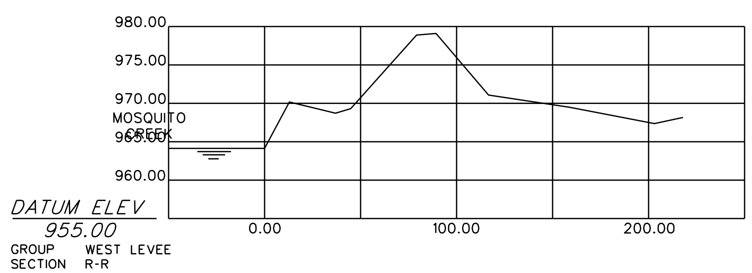
project no.

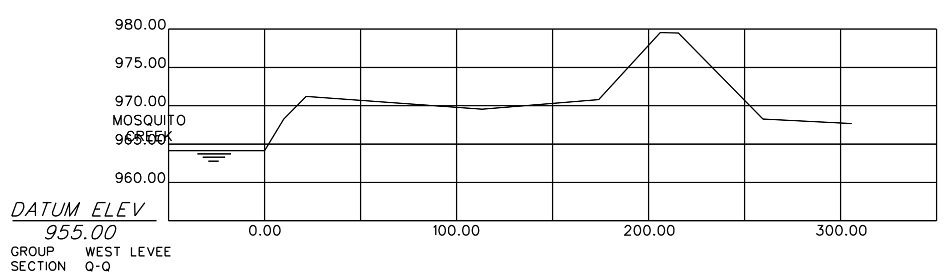
sheet
1 OF 1

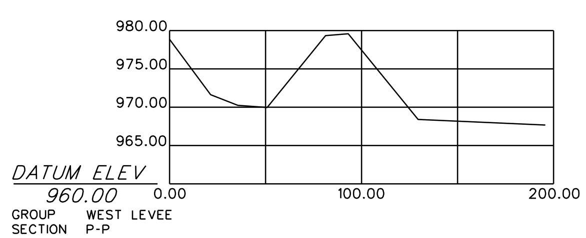
Exhibit D-2











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LAL drawn
designed
TLS approved
SEP '10 date

revision | date

project WSEC IMPOUNDMENT PONDS
BERM STABILITY
client MID AMERICAN ENERGY COMPANY
sheet WEST LEVEE CROSS SECTIONS

project no.

sheet
1 OF 1

File Name: Sect A-A.gsz
BWL   Date: 10/13/2010

Name: Silty Sand   Unit Weight: 125 pcf   Cohesion: 0 psf   Phi: 29 °
Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay (Stiff)   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay (Med)   Unit Weight: 120 pcf   Cohesion: 0 psf   Phi: 24 °
Name: Fat Clay (V. Soft)   Unit Weight: 120 pcf   Cohesion: 0 psf   Phi: 20 °

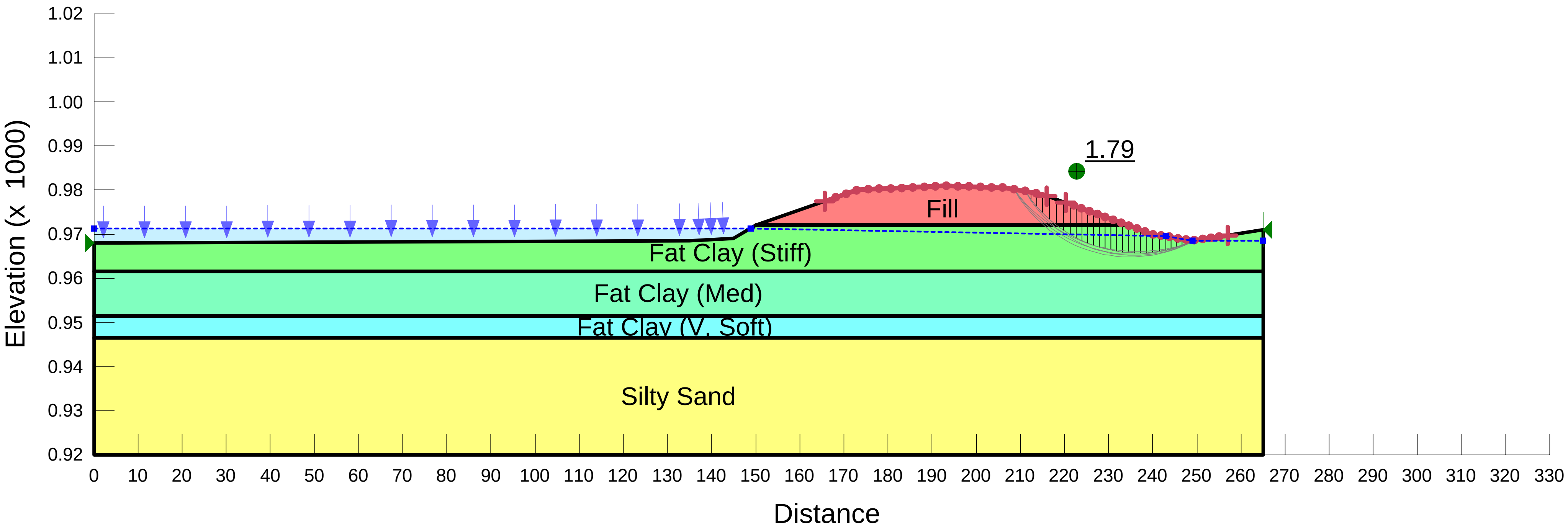

Exhibit D-4

File Name: Sect A-A (up).gsz
BWL Date: 10/13/2010

Name: Silty Sand Unit Weight: 125 pcf Cohesion: 0 psf Phi: 29 °
Name: Fill Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °
Name: Fat Clay (Stiff) Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °
Name: Fat Clay (Med) Unit Weight: 120 pcf Cohesion: 0 psf Phi: 24 °
Name: Fat Clay (V. Soft) Unit Weight: 120 pcf Cohesion: 0 psf Phi: 20 °

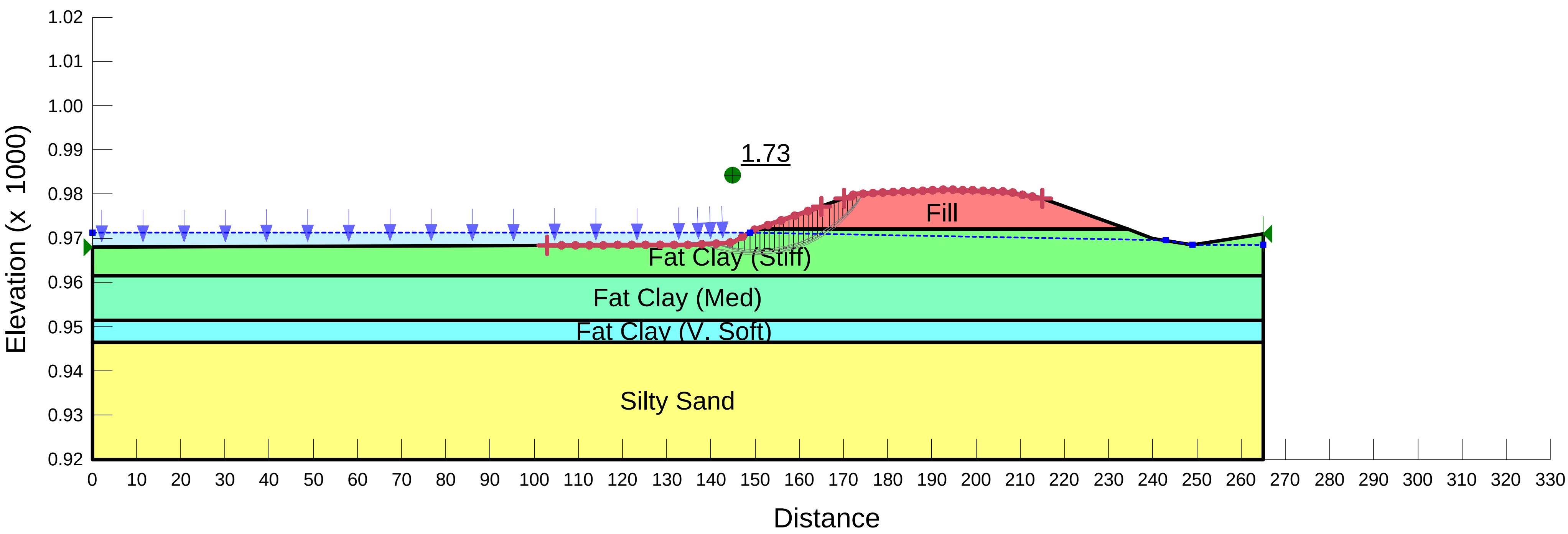

Exhibit D-5

File Name: Sect A-A (seismic).gsz
BWL Date: 10/13/2010

Name: Silty Sand Unit Weight: 125 pcf Cohesion: 0 psf Phi: 29 °
Name: Fill Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °
Name: Fat Clay (Stiff) Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °
Name: Fat Clay (Med) Unit Weight: 120 pcf Cohesion: 0 psf Phi: 24 °
Name: Fat Clay (V. Soft) Unit Weight: 120 pcf Cohesion: 0 psf Phi: 20 °

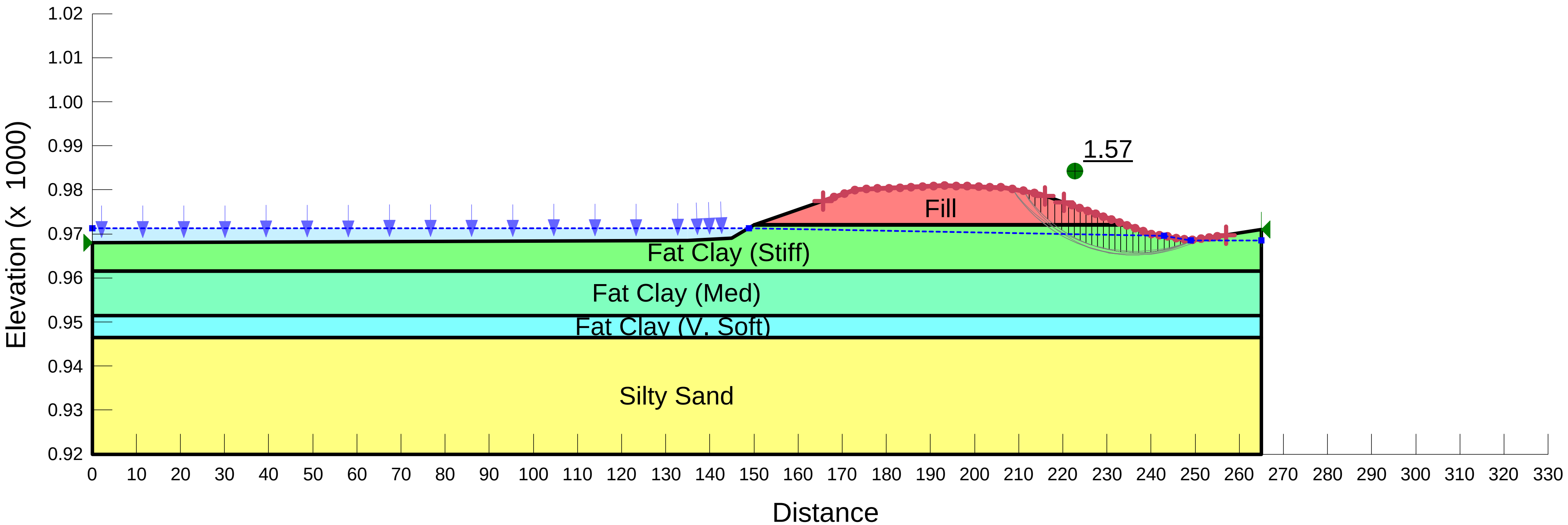

Exhibit D-6

File Name: Sect A-A seismic (up).gsz
BWL Date: 10/13/2010

Name: Silty Sand Unit Weight: 125 pcf Cohesion: 0 psf Phi: 29 °
Name: Fill Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °
Name: Fat Clay (Stiff) Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °
Name: Fat Clay (Med) Unit Weight: 120 pcf Cohesion: 0 psf Phi: 24 °
Name: Fat Clay (V. Soft) Unit Weight: 120 pcf Cohesion: 0 psf Phi: 20 °

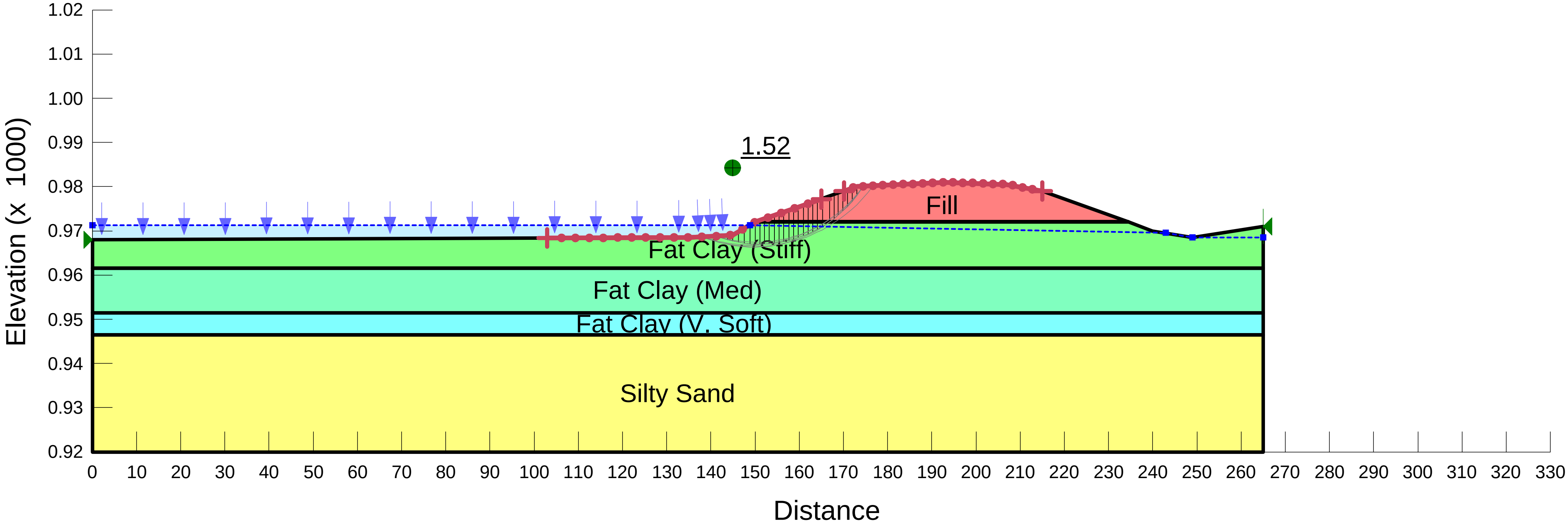

Exhibit D-7

File Name: Sect C-C (phi 26).gsz
BWL   Date: 10/13/2010

Name: Silty Sand   Unit Weight: 125 pcf   Cohesion: 0 psf   Phi: 29 °
Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay (Stiff)   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay (Med Stiff)   Unit Weight: 120 pcf   Cohesion: 0 psf   Phi: 24 °
Name: Fat Clay (V. Soft)   Unit Weight: 120 pcf   Cohesion: 0 psf   Phi: 20 °

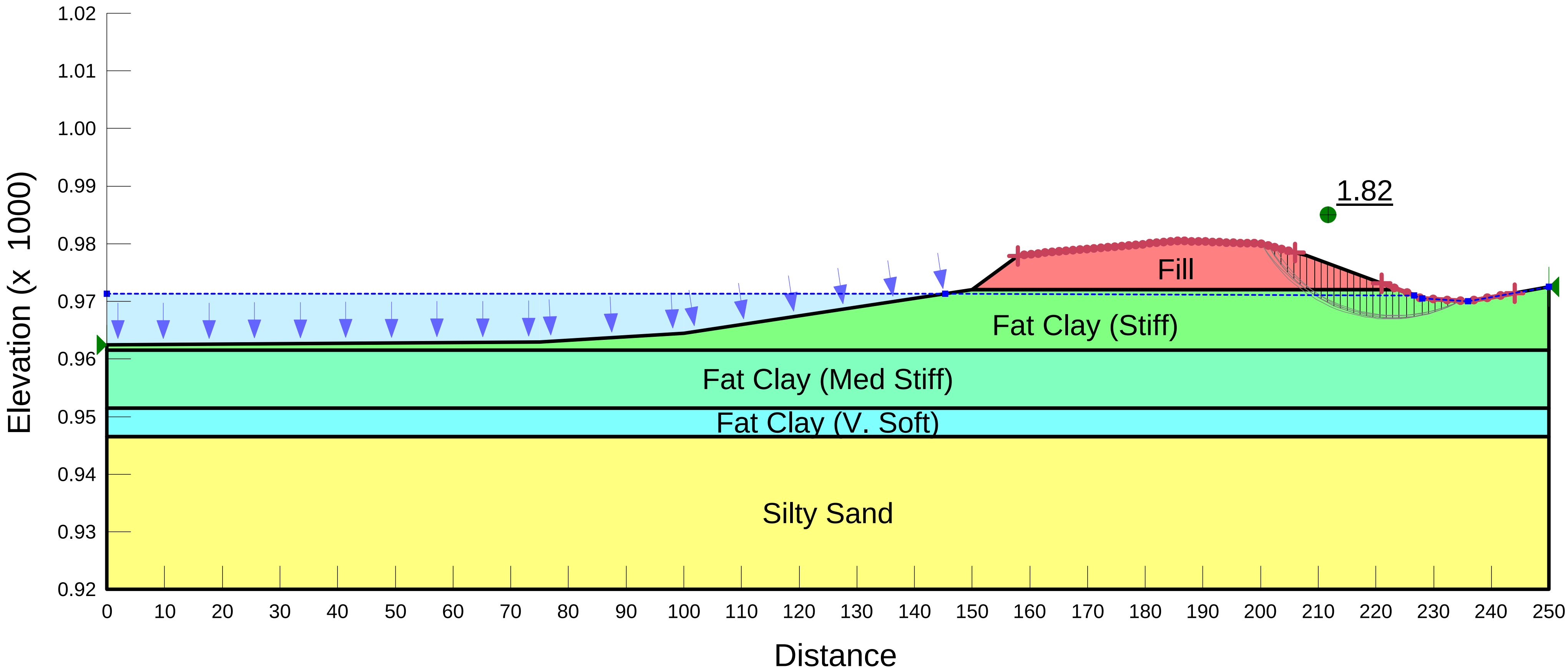

Exhibit D-8

File Name: Sect C-C (Up) phi 26.gsz
BWL   Date: 10/13/2010

Name: Silty Sand   Unit Weight: 125 pcf   Cohesion: 0 psf   Phi: 29 °
Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay (Stiff)   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay (Med Stiff)   Unit Weight: 120 pcf   Cohesion: 0 psf   Phi: 24 °
Name: Fat Clay (V. Soft)   Unit Weight: 120 pcf   Cohesion: 0 psf   Phi: 20 °

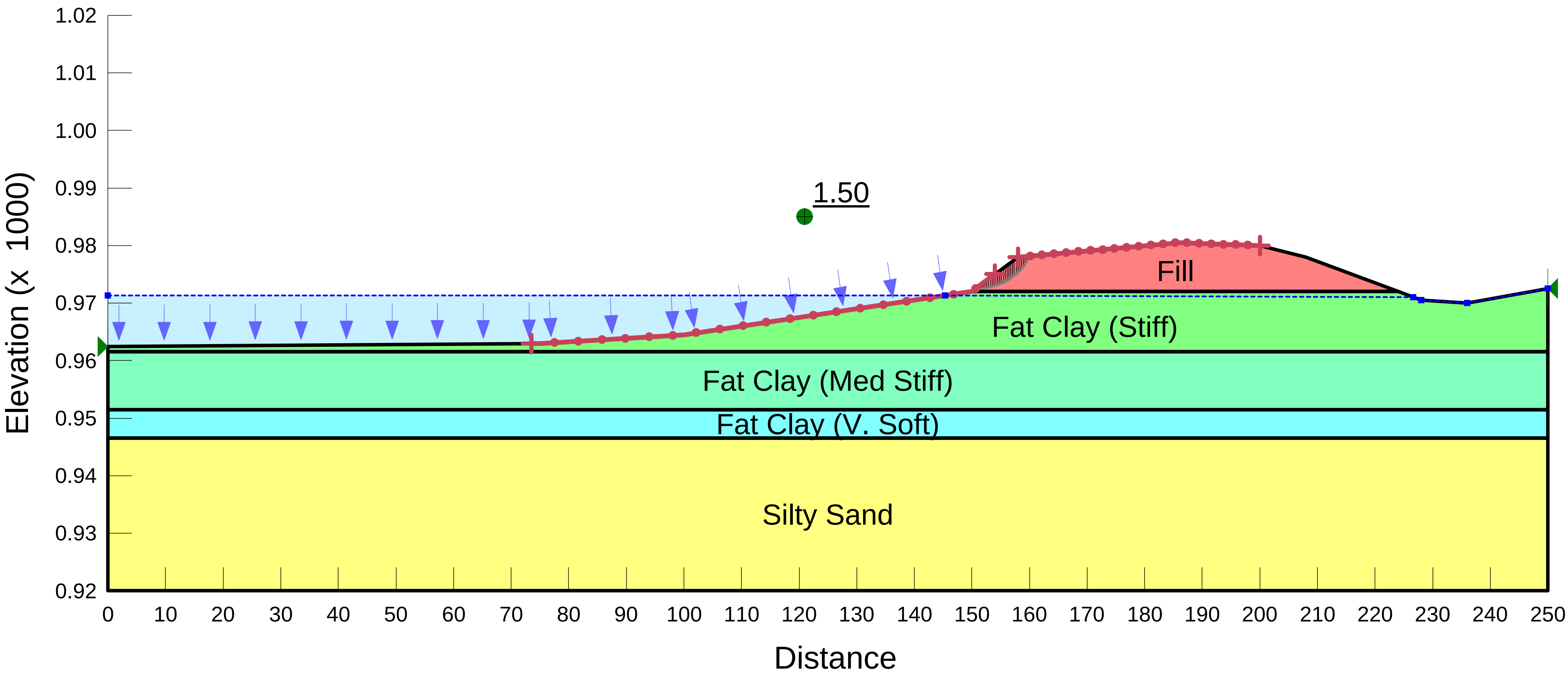

Exhibit D-9

File Name: Sect C-C (Seismic).gsz
BWL   Date: 10/13/2010

Name: Silty Sand   Unit Weight: 125 pcf   Cohesion: 0 psf   Phi: 29 °
Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay (Stiff)   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay (Med Stiff)   Unit Weight: 120 pcf   Cohesion: 0 psf   Phi: 24 °
Name: Fat Clay (V. Soft)   Unit Weight: 120 pcf   Cohesion: 0 psf   Phi: 20 °

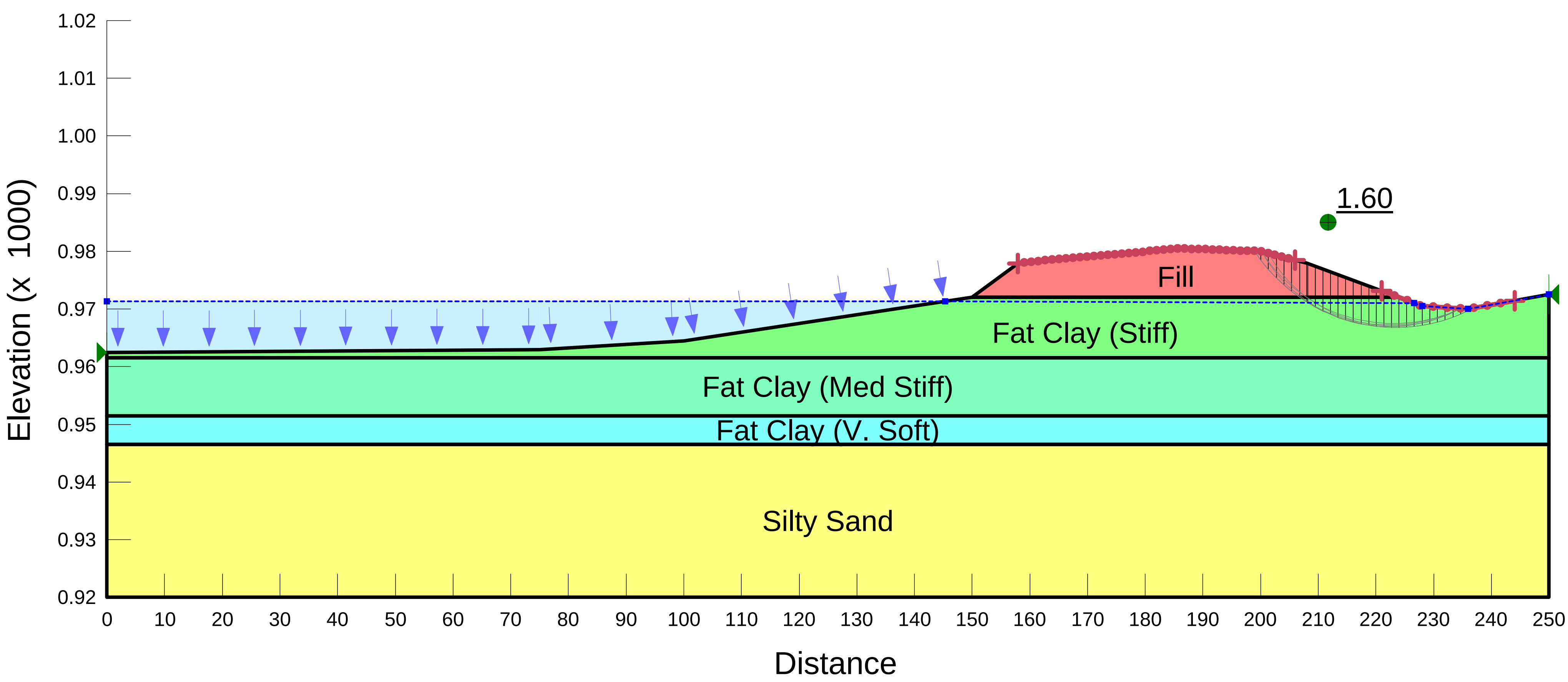

Exhibit D-10

File Name: Sect C-C (Up Seismic).gsz
BWL   Date: 10/13/2010

Name: Silty Sand   Unit Weight: 125 pcf   Cohesion: 0 psf   Phi: 29 °
Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay (Stiff)   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay (Med Stiff)   Unit Weight: 120 pcf   Cohesion: 0 psf   Phi: 24 °
Name: Fat Clay (V. Soft)   Unit Weight: 120 pcf   Cohesion: 0 psf   Phi: 20 °

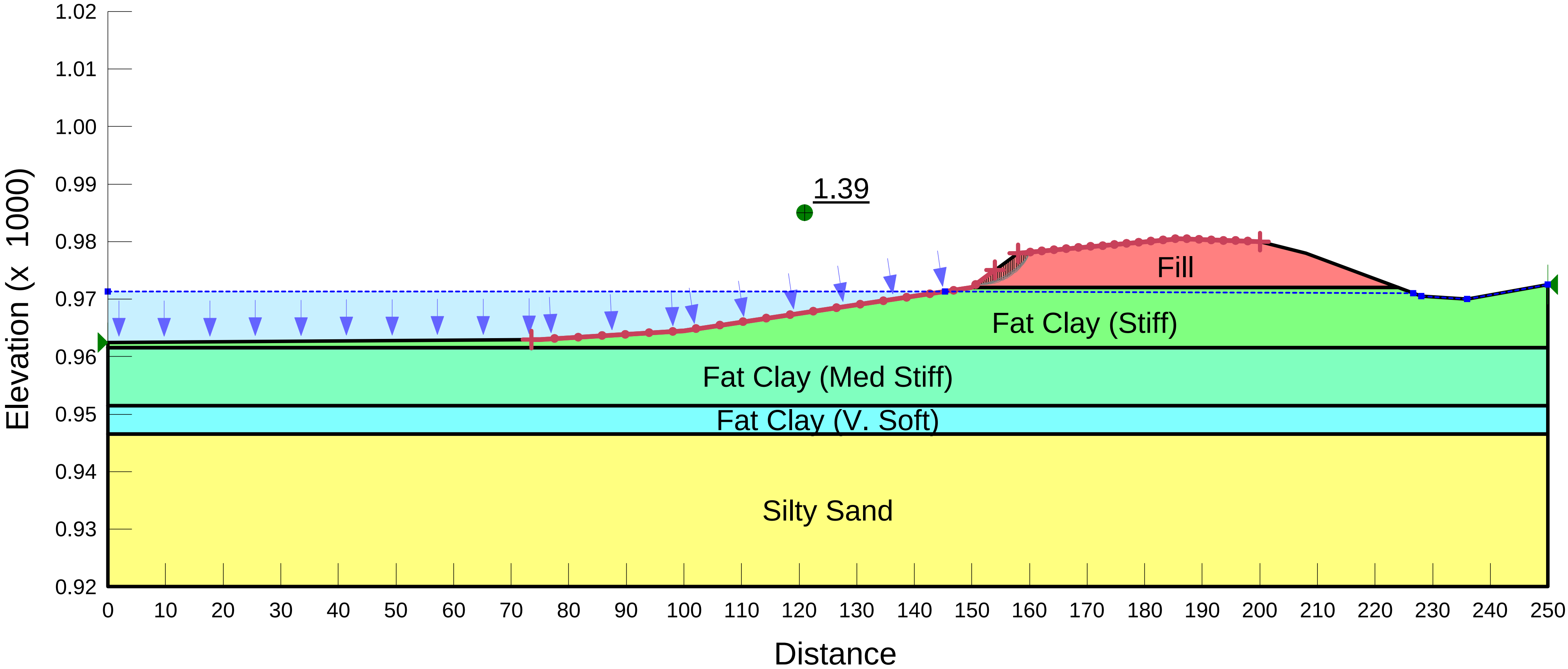

Exhibit D-11

File Name: Sect E-E (phi 26).gsz
BWL   Date: 10/13/2010

Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Very Soft Clay   Unit Weight: 120 pcf   Cohesion: 0 psf   Phi: 20 °

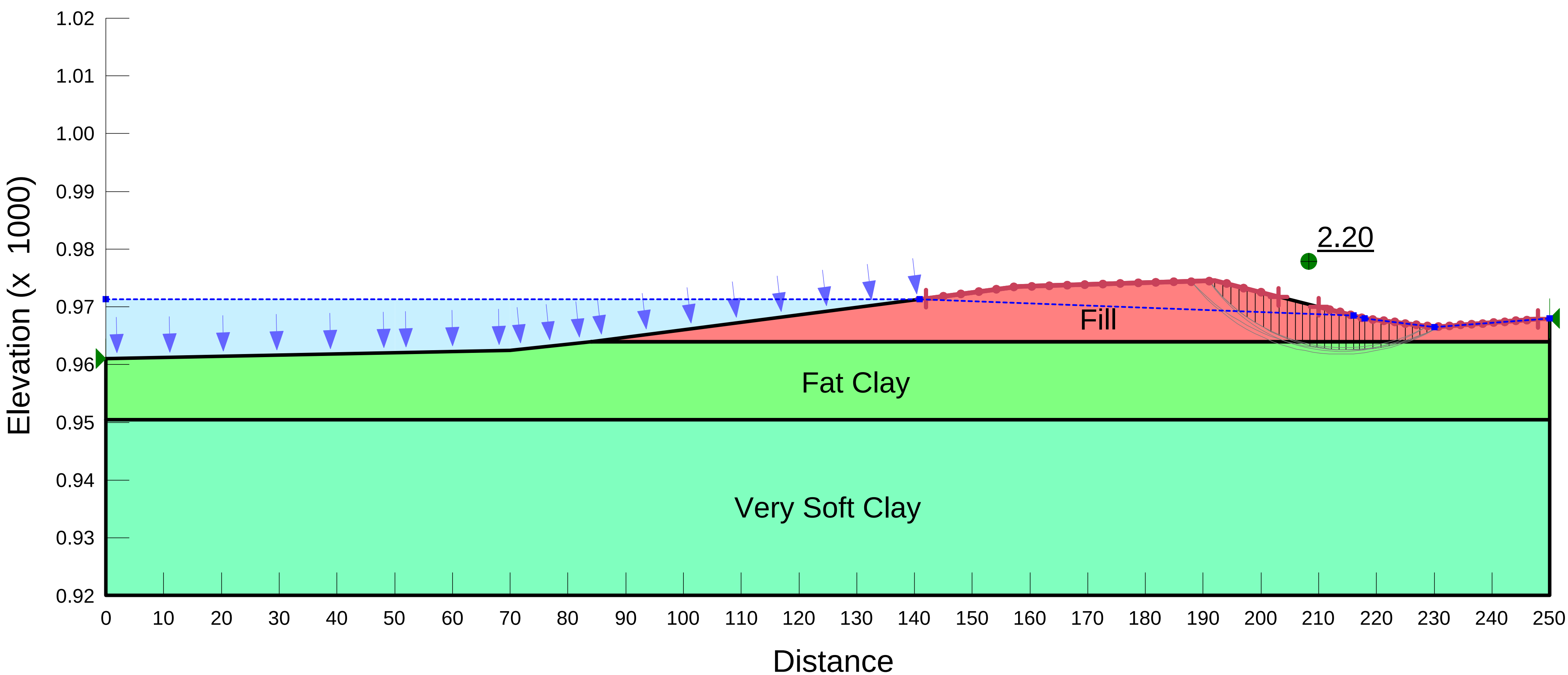

Exhibit D-12

File Name: Sect E-E (Up) phi 26.gsz
BWL   Date: 10/13/2010

Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Very Soft Clay   Unit Weight: 120 pcf   Cohesion: 0 psf   Phi: 20 °

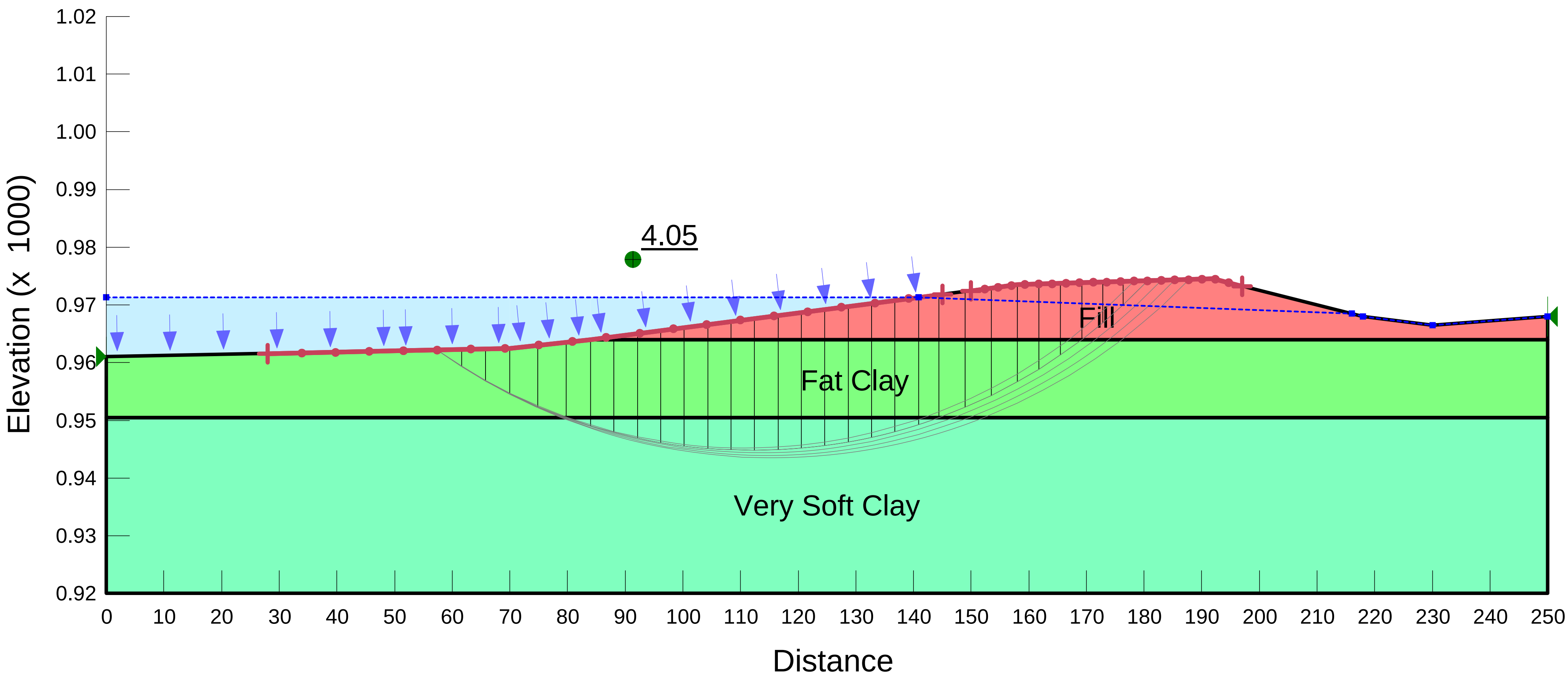

Exhibit D-13

File Name: Sect E-E (Seismic) phi 26.gsz
BWL Date: 10/13/2010

Name: Fill Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °
Name: Fat Clay Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °
Name: Very Soft Clay Unit Weight: 120 pcf Cohesion: 0 psf Phi: 20 °

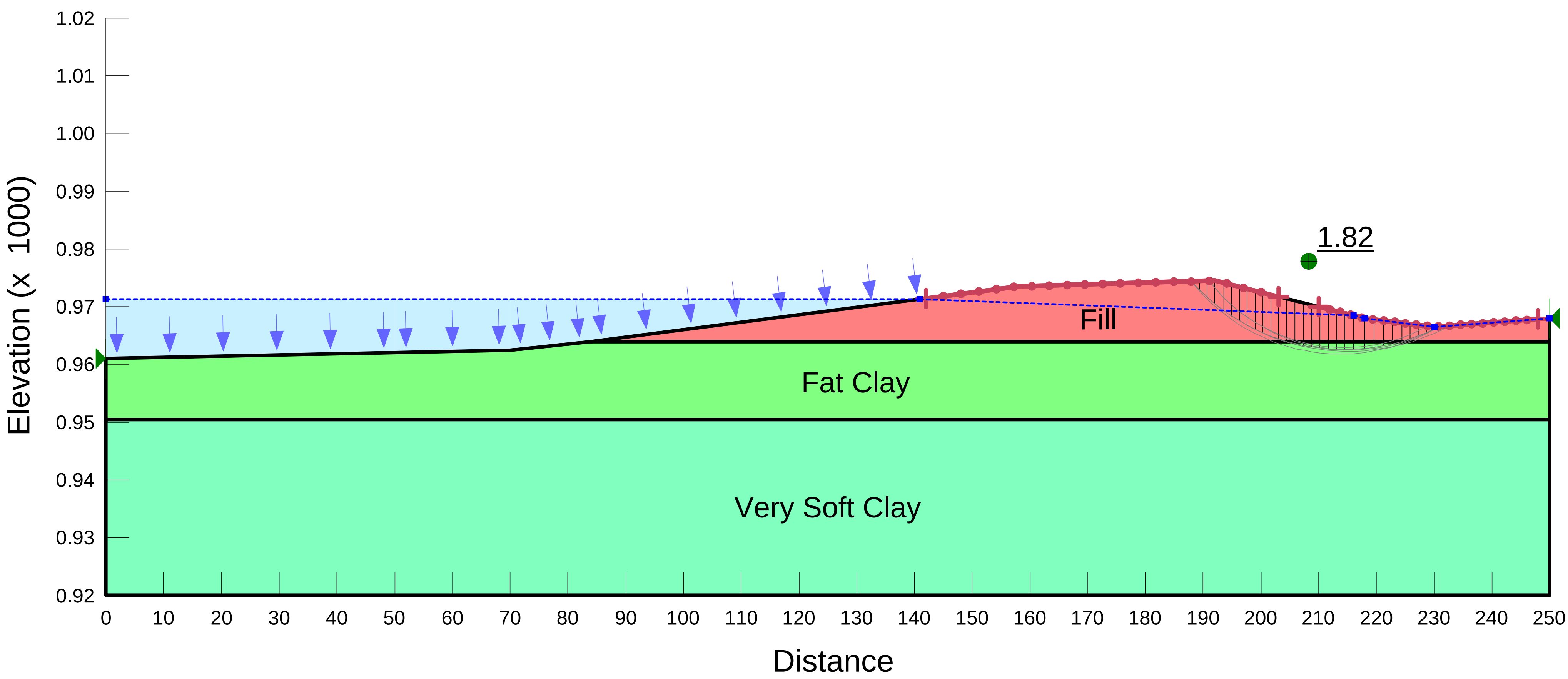

Exhibit D-14

File Name: Sect E-E (Up Seismic) phi 26.gsz
BWL Date: 10/13/2010

Name: Fill Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °
Name: Fat Clay Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °
Name: Very Soft Clay Unit Weight: 120 pcf Cohesion: 0 psf Phi: 20 °

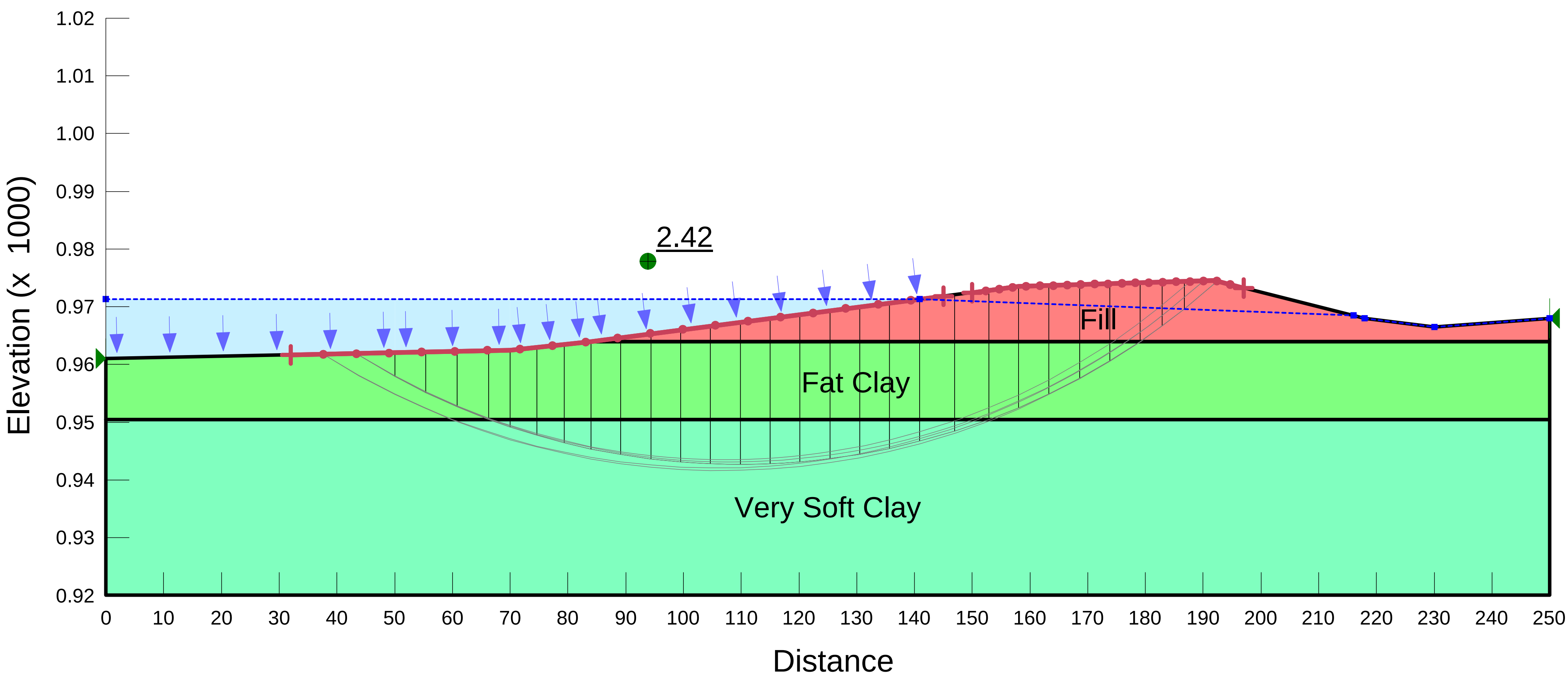

Exhibit D-15

File Name: Sect F-F phi 26.gsz
BWL   Date: 10/13/2010

Name: Silty Sand   Unit Weight: 125 pcf   Cohesion: 0 psf   Phi: 29 °
Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay (Med to Stiff)   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay (Soft to V. Soft)   Unit Weight: 120 pcf   Cohesion: 0 psf   Phi: 20 °

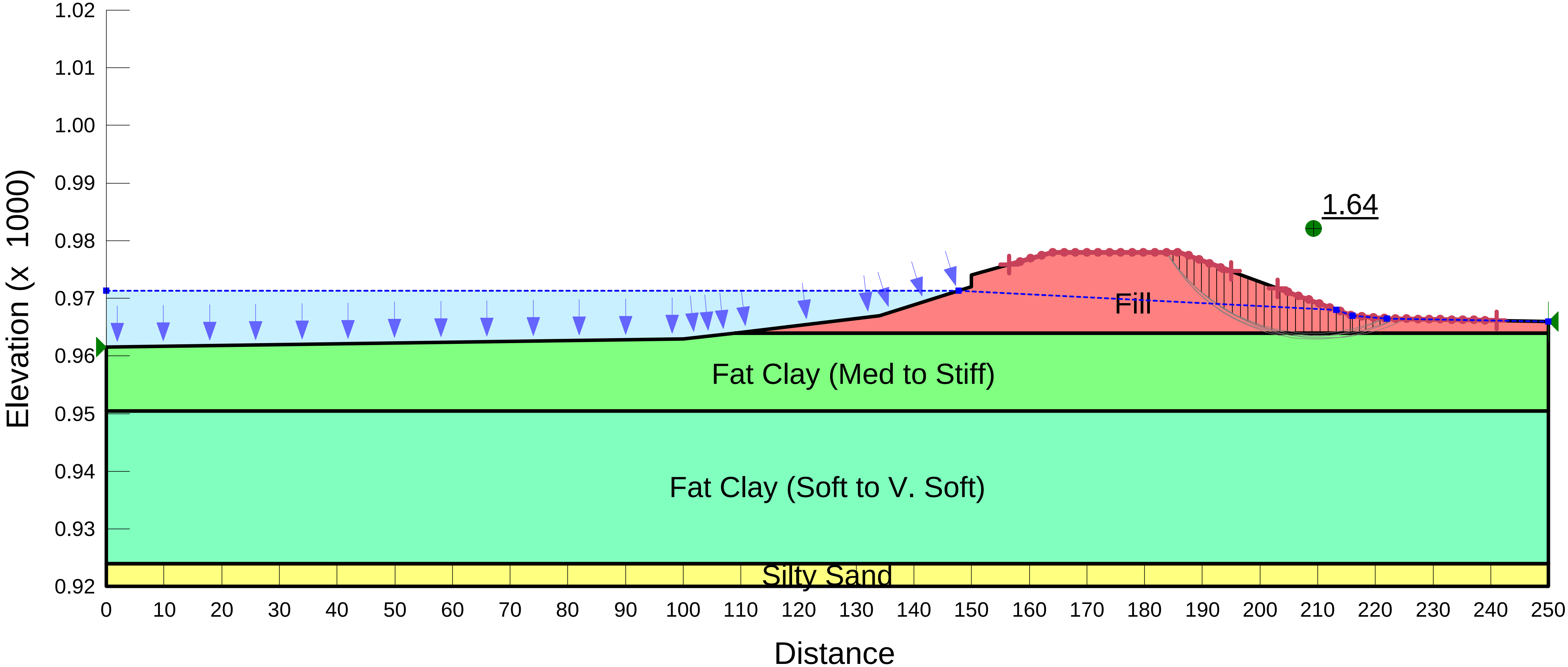

Exhibit D-16

File Name: Sect F-F (Up) phi 26.gsz
BWL Date: 10/13/2010

Name: Silty Sand Unit Weight: 125 pcf Cohesion: 0 psf Phi: 29 °
Name: Fill Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °
Name: Fat Clay (Med to Stiff) Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °
Name: Fat Clay (Soft to V. Soft) Unit Weight: 120 pcf Cohesion: 0 psf Phi: 20 °

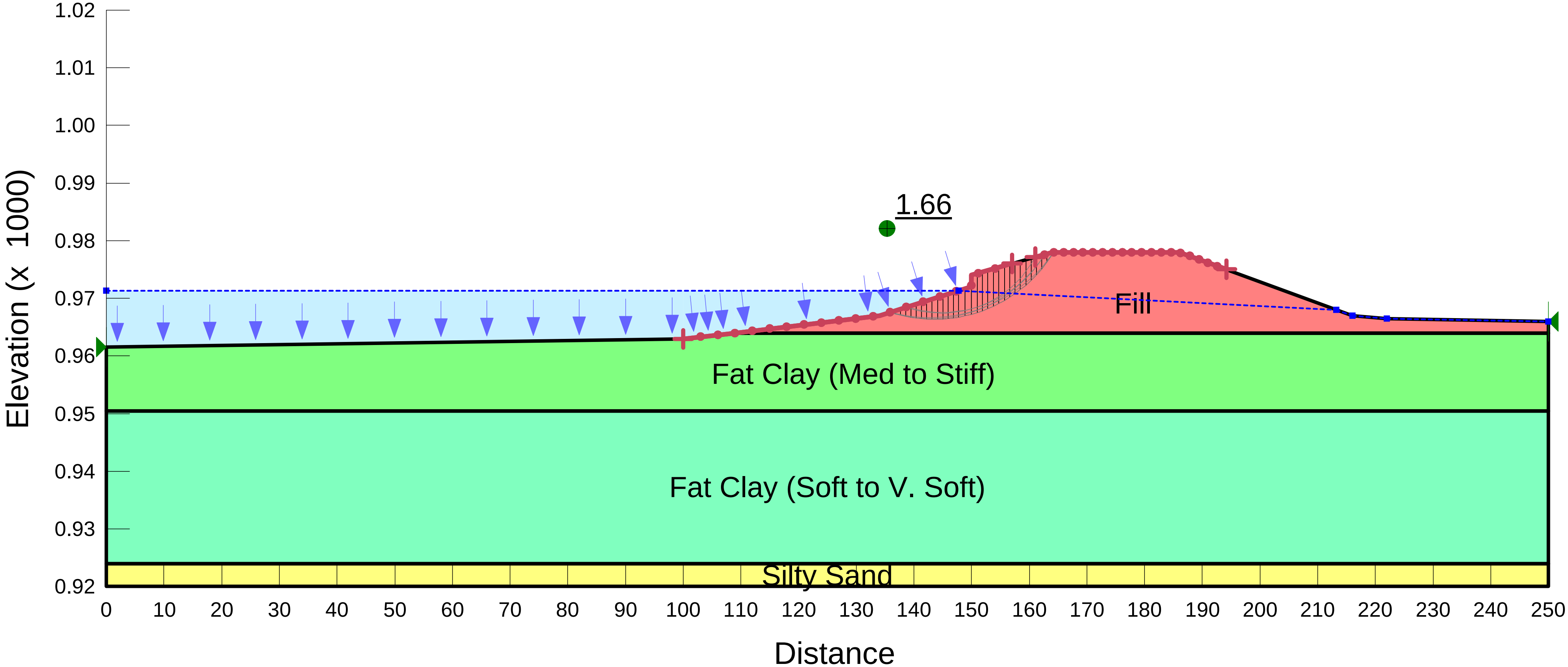

Exhibit D-17

File Name: Sect F-F (seismic) phi 26.gsz
BWL   Date: 10/13/2010

Name: Silty Sand   Unit Weight: 125 pcf   Cohesion: 0 psf   Phi: 29 °
Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay (Med to Stiff)   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay (Soft to V. Soft)   Unit Weight: 120 pcf   Cohesion: 0 psf   Phi: 20 °

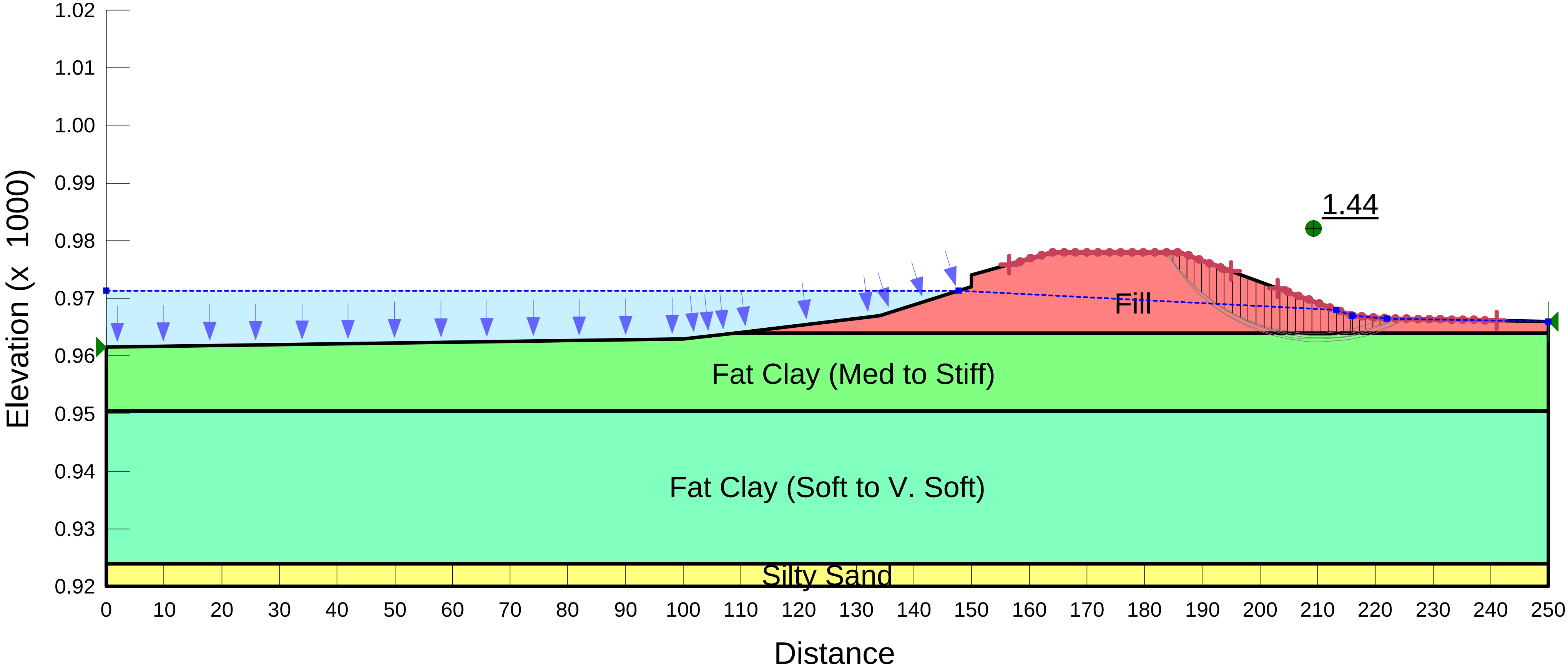

Exhibit D-18

File Name: Sect F-F (Up Seismic) phi 26.gsz
BWL   Date: 10/13/2010

Name: Silty Sand   Unit Weight: 125 pcf   Cohesion: 0 psf   Phi: 29 °
Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay (Med to Stiff)   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay (Soft to V. Soft)   Unit Weight: 120 pcf   Cohesion: 0 psf   Phi: 20 °

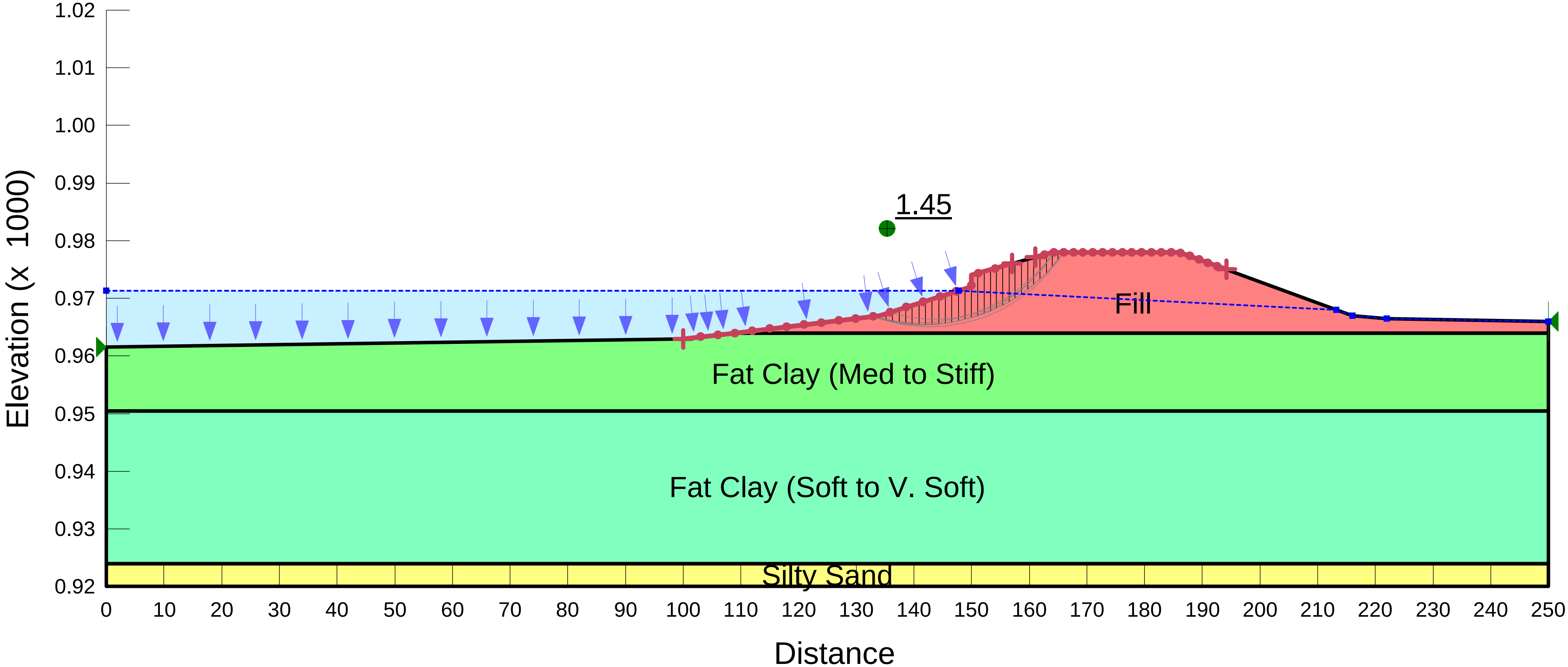

Exhibit D-19

File Name: Sect L-L (phi 26).gsz
BWL   Date: 10/13/2010

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Name: Fat Clay   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °

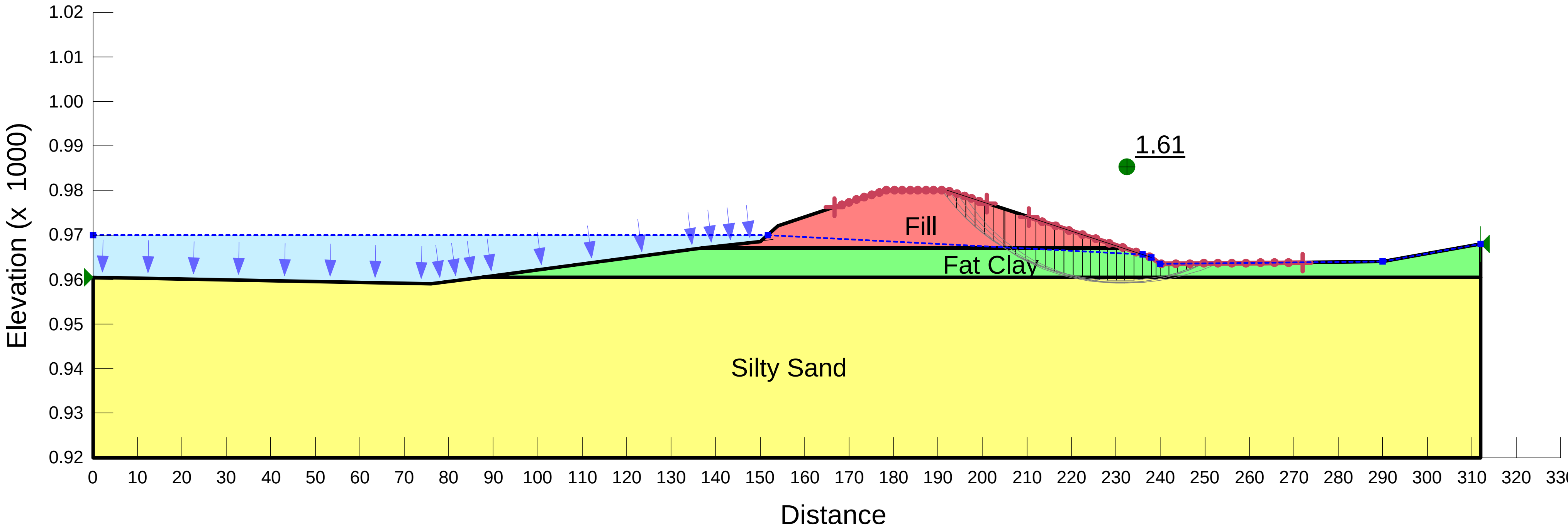

Exhibit D-20

File Name: Sect L-L (up) phi 26.gsz
BWL Date: 10/13/2010

Name: Silty Sand Unit Weight: 125 pcf Cohesion: 0 psf Phi: 29 °
Name: Fill Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °
Name: Fat Clay Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °

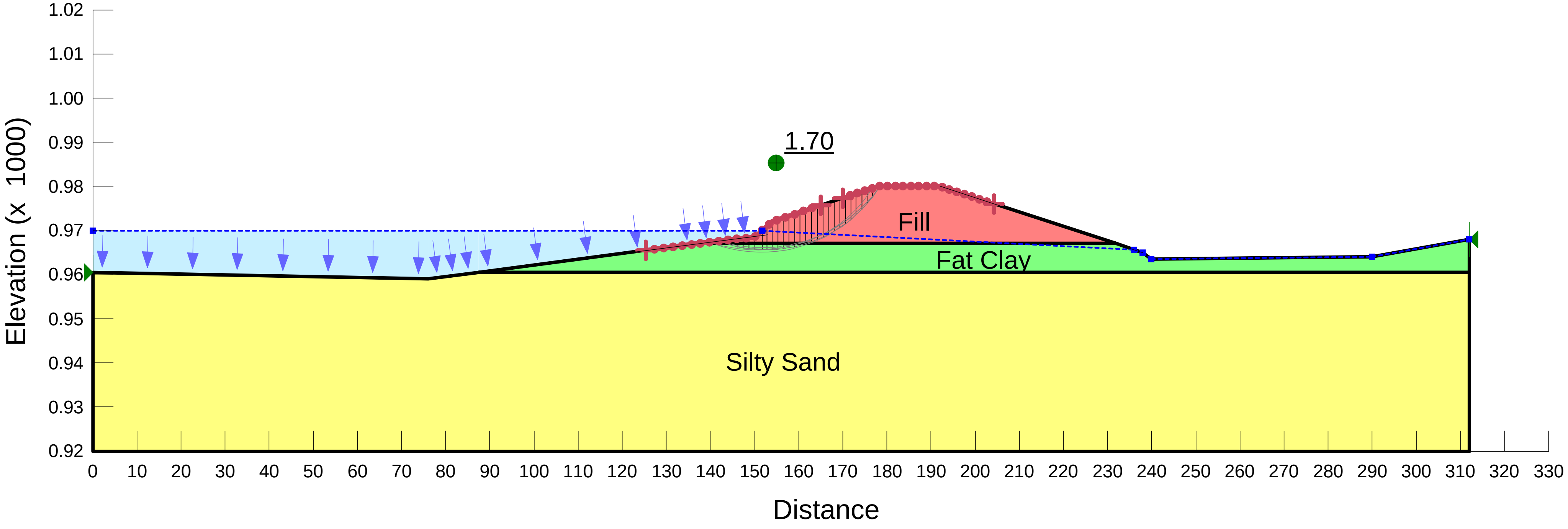

Exhibit D-21

File Name: Sect L-L (seismic) phi 26.gsz
BWL   Date: 10/13/2010

Name: Silty Sand   Unit Weight: 125 pcf   Cohesion: 0 psf   Phi: 29 °
Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °

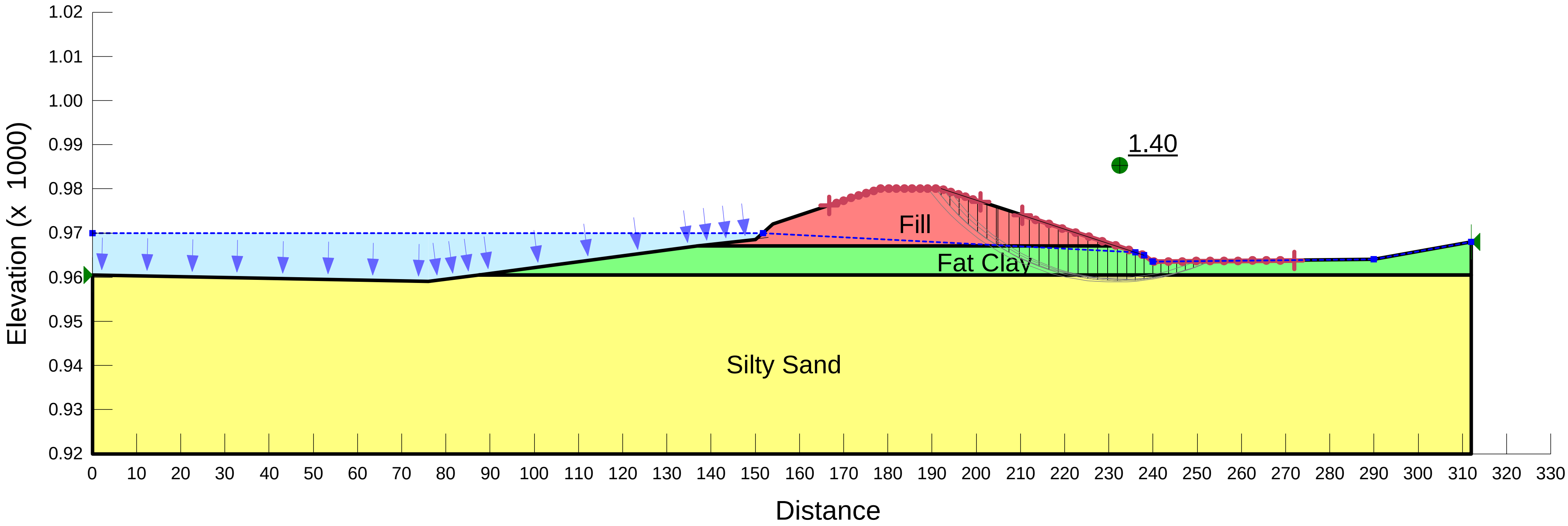

Exhibit D-22

File Name: Sect L-L (up seismic) phi 26.gsz
BWL   Date: 10/13/2010

Name: Silty Sand   Unit Weight: 125 pcf   Cohesion: 0 psf   Phi: 29 °
Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °

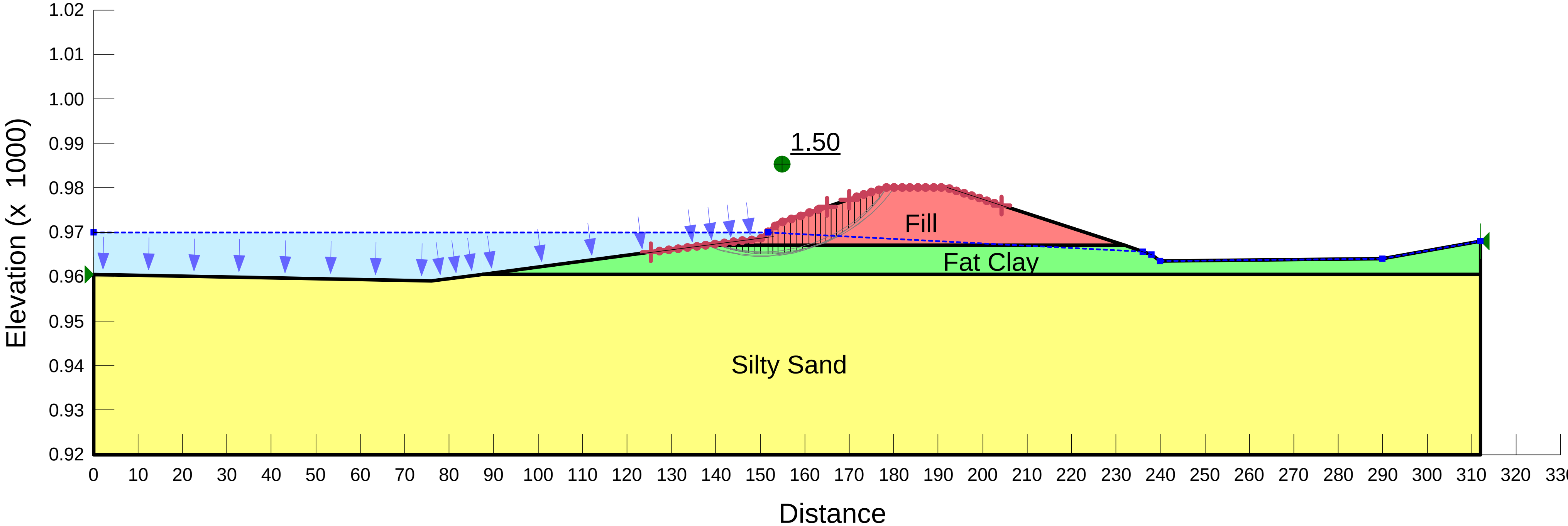

Exhibit D-23

File Name: Sect M-M phi 26.gsz
BWL   Date: 10/13/2010

Name: Silty Sand   Unit Weight: 125 pcf   Cohesion: 0 psf   Phi: 29 °
Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °

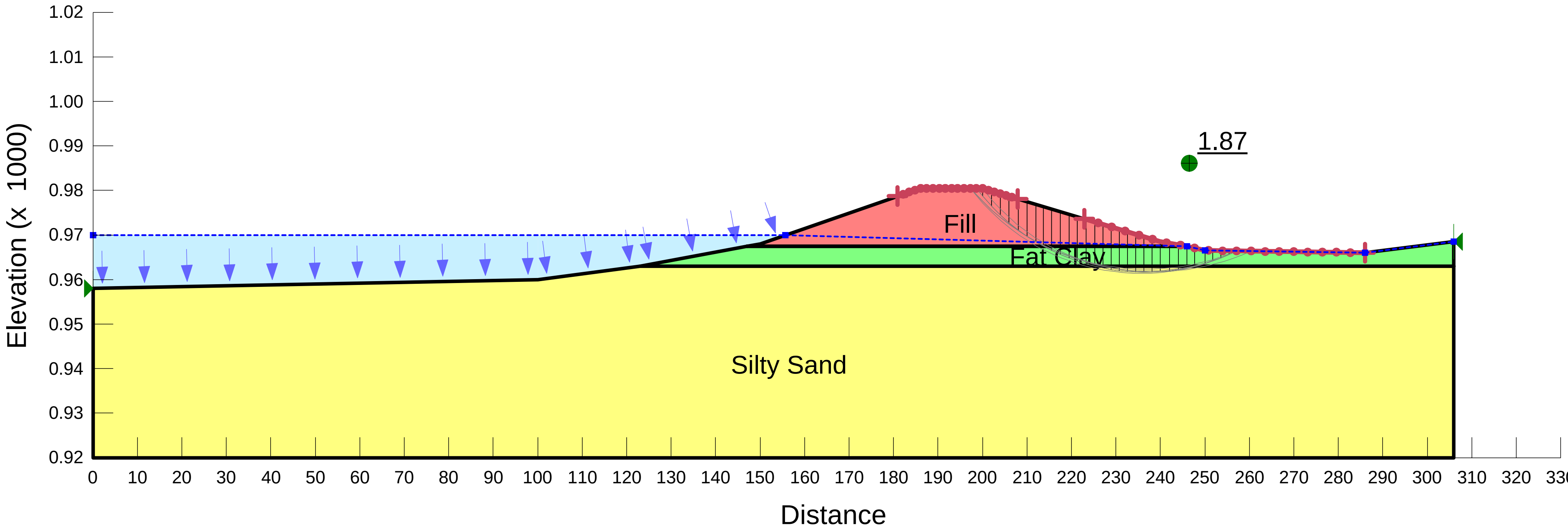

Exhibit D-24

File Name: Sect M-M (UP) phi 26.gsz
BWL Date: 10/13/2010

Name: Silty Sand Unit Weight: 125 pcf Cohesion: 0 psf Phi: 29 °
Name: Fill Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °
Name: Fat Clay Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °

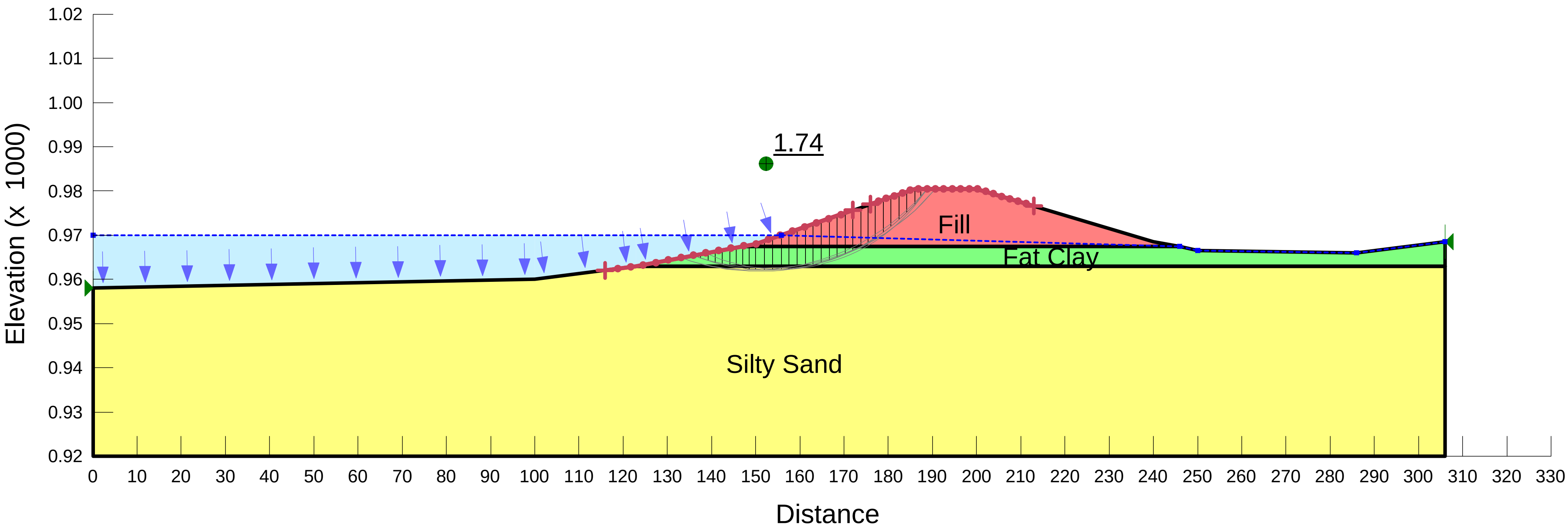

Exhibit D-25

File Name: Sect M-M (seismic) phi 26.gsz
BWL   Date: 10/13/2010

Name: Silty Sand   Unit Weight: 125 pcf   Cohesion: 0 psf   Phi: 29 °
Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °

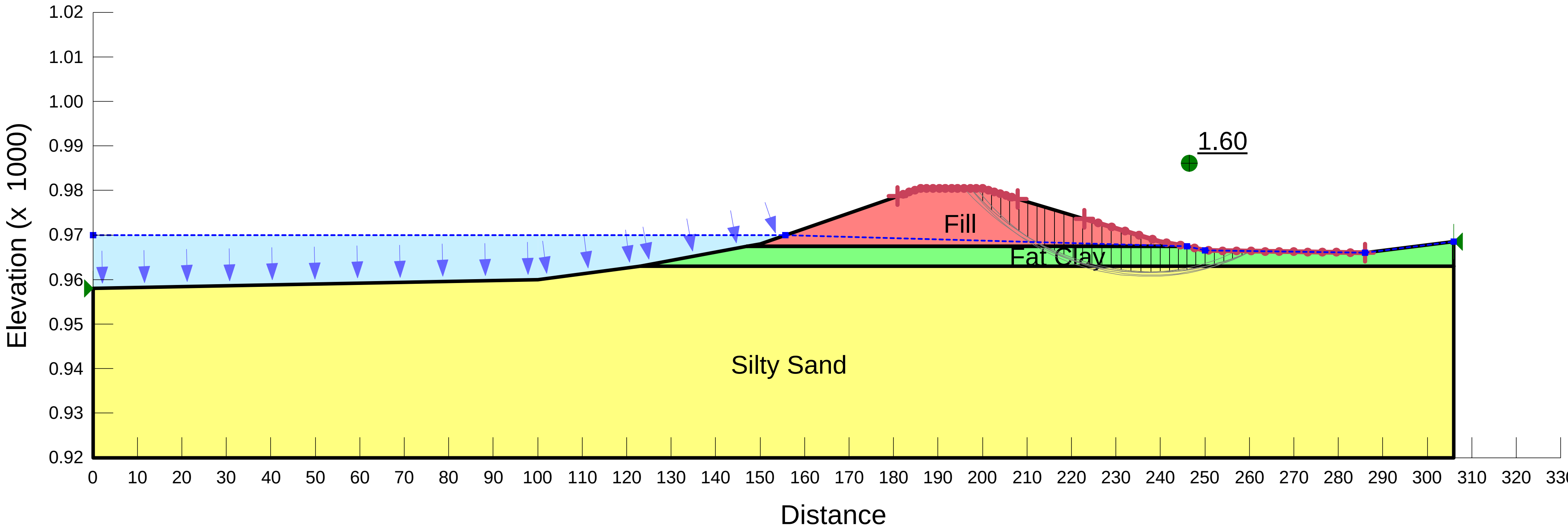

Exhibit D-26

File Name: Sect M-M (UP seismic) phi 26.gsz
BWL   Date: 10/13/2010

Name: Silty Sand   Unit Weight: 125 pcf   Cohesion: 0 psf   Phi: 29 °
Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °

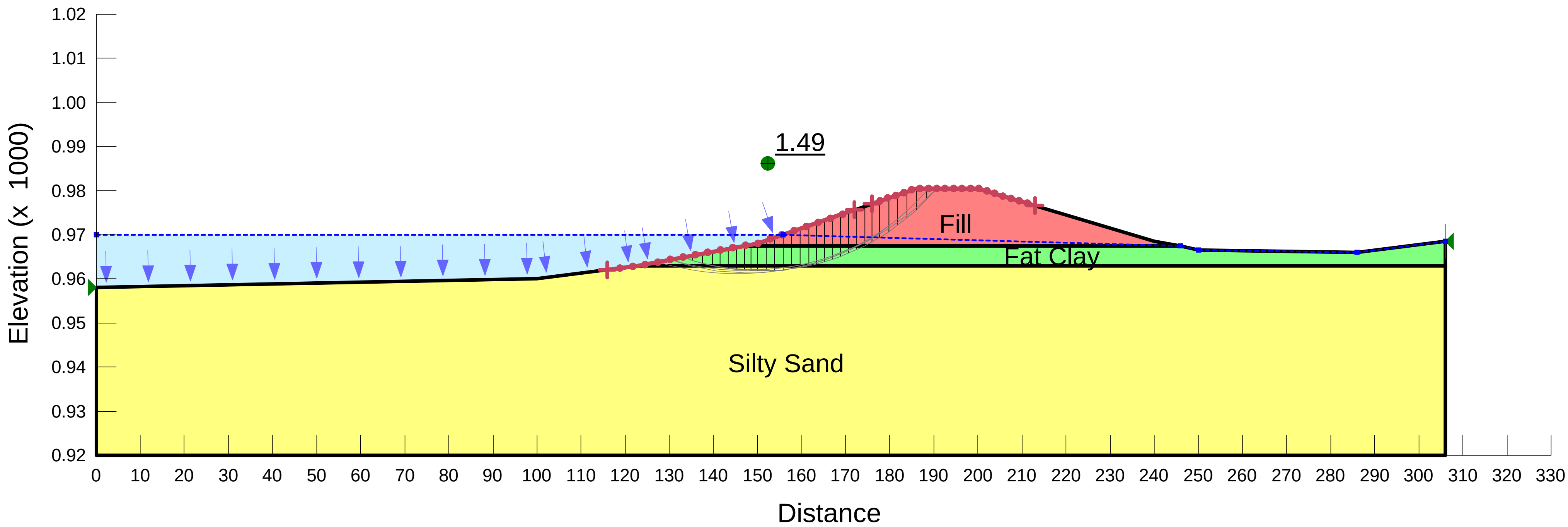

Exhibit D-27

File Name: Sect O-O (phi 26).gsz
BWL Date: 10/13/2010

Name: Silty Sand Unit Weight: 125 pcf Cohesion: 0 psf Phi: 29 °
Name: Fill Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °
Name: Fat Clay Unit Weight: 120 pcf Cohesion: 50 psf Phi: 26 °

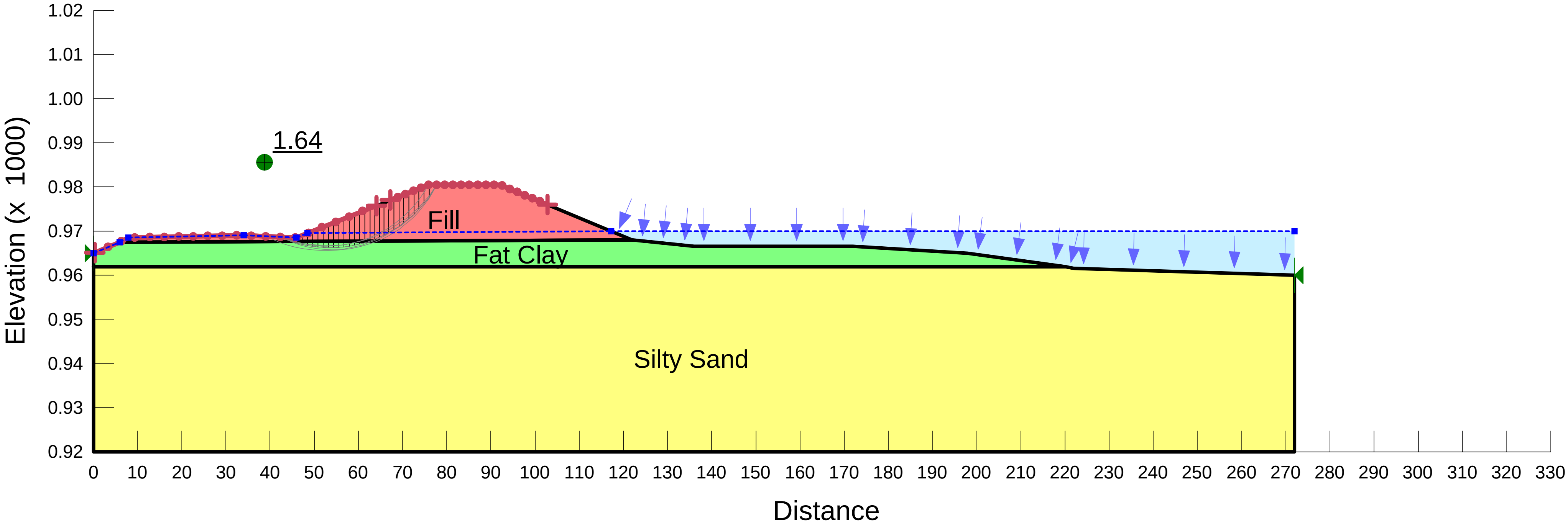

Exhibit D-28

File Name: Sect O-O (up) phi=26.gsz
BWL   Date: 10/13/2010

Name: Silty Sand   Unit Weight: 125 pcf   Cohesion: 0 psf   Phi: 29 °
Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °

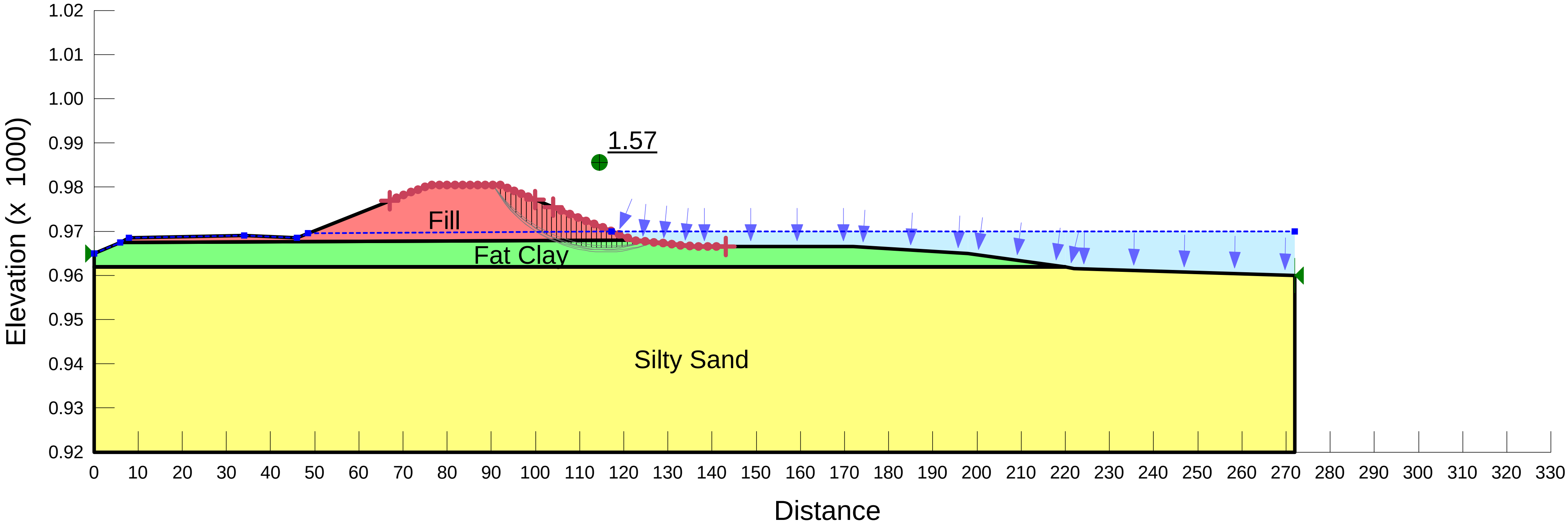

Exhibit D-29

File Name: Sect O-O (seismic) phi 26.gsz
BWL   Date: 10/13/2010

Name: Silty Sand   Unit Weight: 125 pcf   Cohesion: 0 psf   Phi: 29 °
Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
Name: Fat Clay   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °

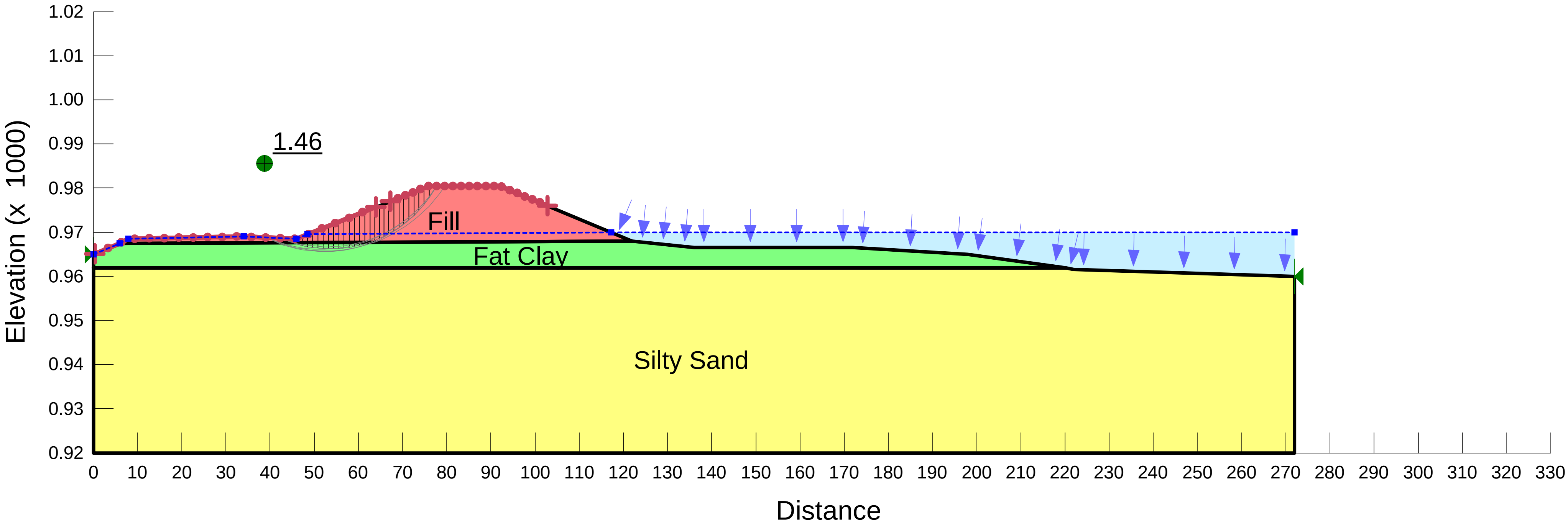

Exhibit D-30

File Name: Sect O-O (up seismic) phi 26.gsz
BWL   Date: 10/13/2010

Name: Silty Sand   Unit Weight: 125 pcf   Cohesion: 0 psf   Phi: 29 °
Name: Fill   Unit Weight: 120 pcf   Cohesion: 50 psf   Phi: 26 °
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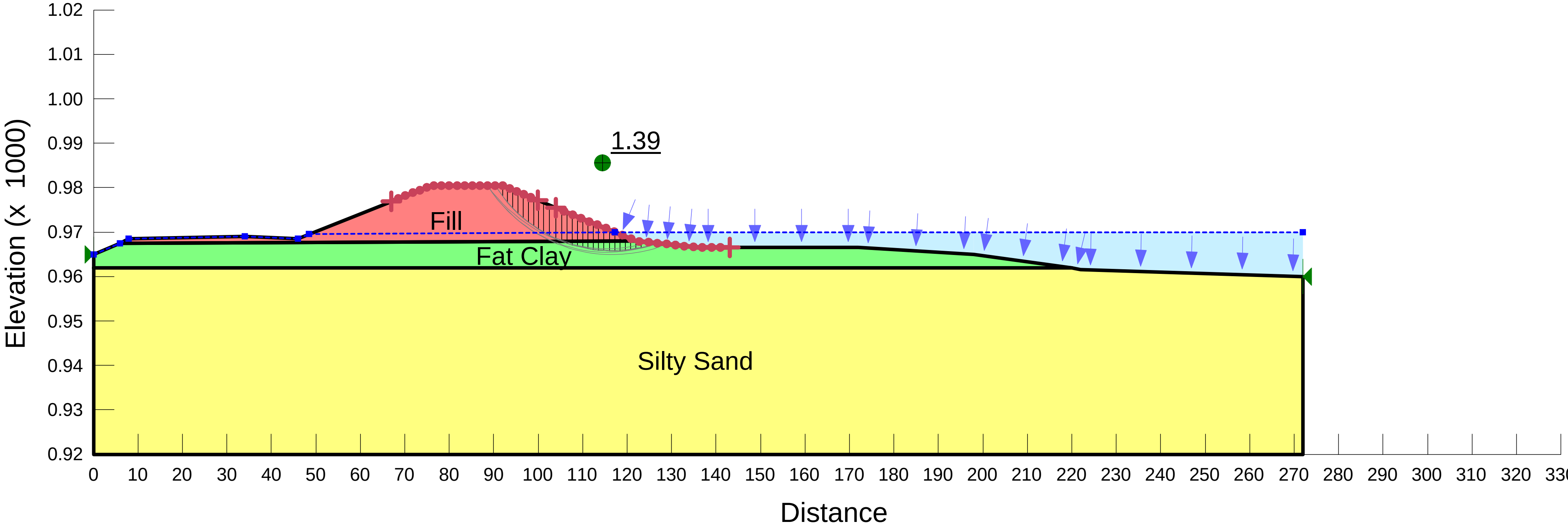


Exhibit D-31

APPENDIX E

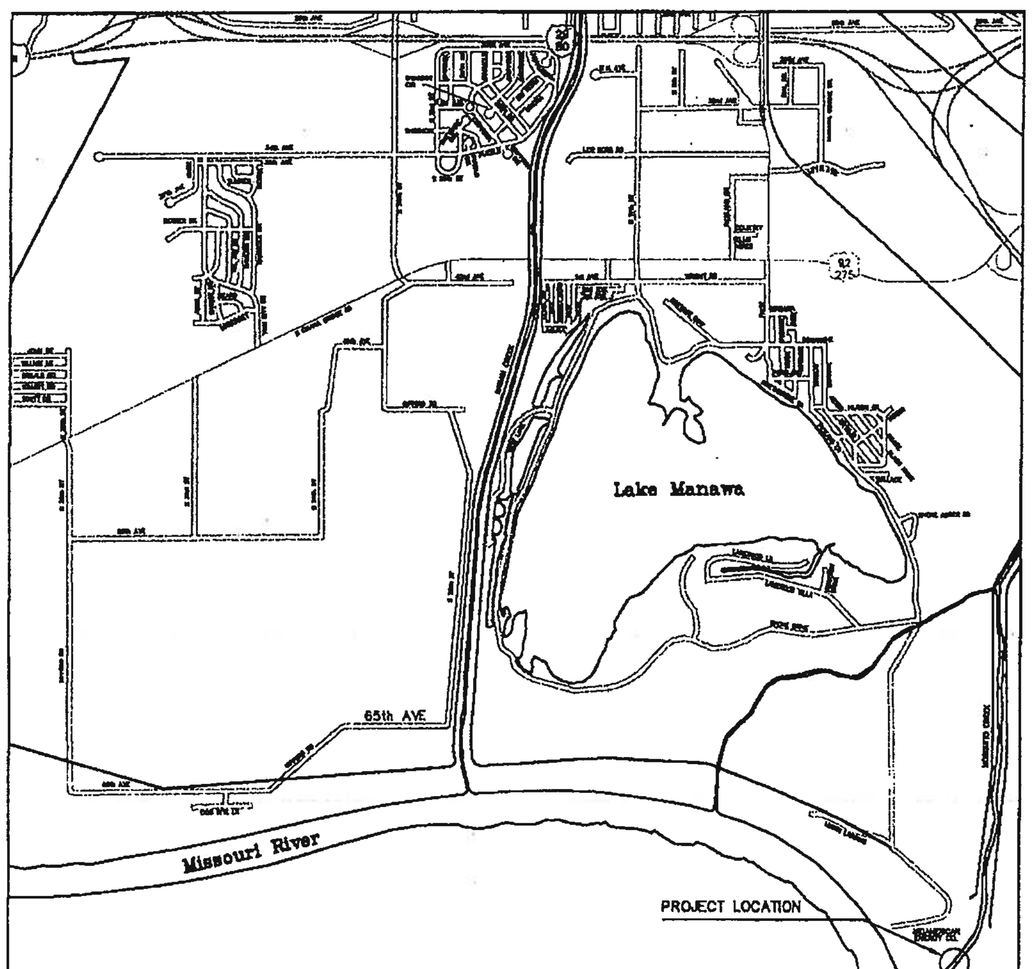
MISCELLANEOUS INFORMATION

APPENDIX E

RETURN FLUME RECONSTRUCTION AND LEVEE REHABILITATION

MIDAMERICAN ENERGY

RETURN FLUME RECONSTRUCTION AND LEVEE REHABILITIATION



LOCATION MAP
COUNCIL BLUFFS, IOWA
NO SCALE

INDEX

SPECIFICATIONS

THE IOWA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION SERIES 1997, SHALL GOVERN THIS PROJECT.

PLUS CURRENT SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS

LICENSED PROFESSIONAL ENGINEER
PAUL M. KLINE
8840
IOWA

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

PAUL M. KLINE   DATE

My license renewal date is December 31, 2001.

Pages or sheets covered by this seal:
A.01,B.01,C.01,C.02,D.01–D.02

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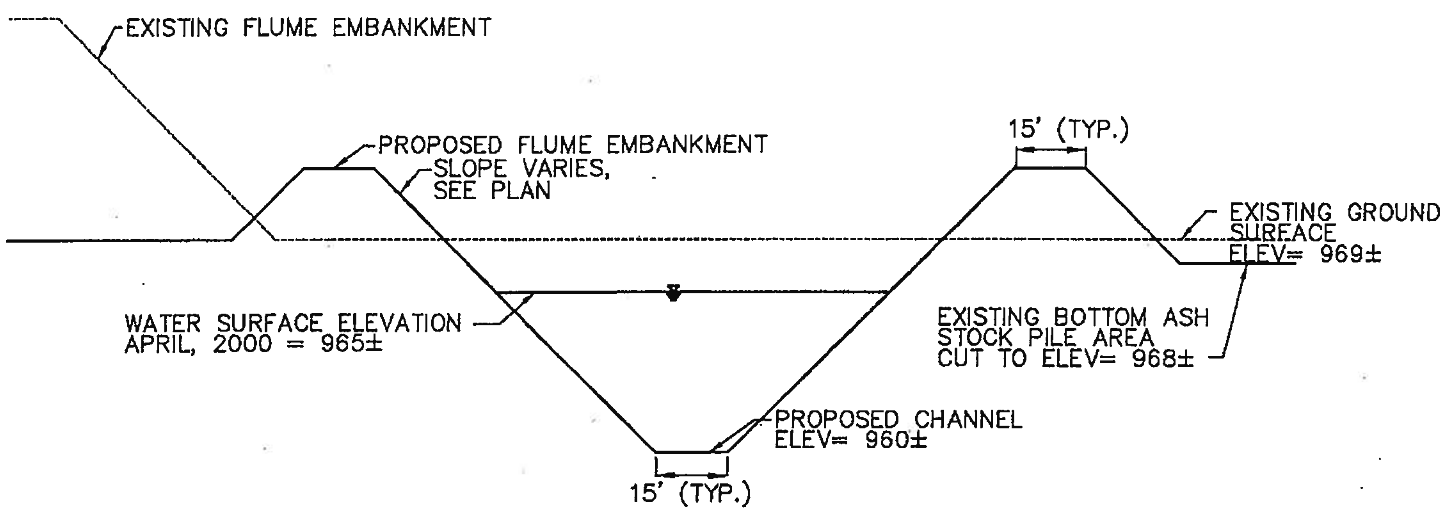
council bluffs omaha

DDI drawn
DAB designed
PMK approved
MAY '00 date
revision date

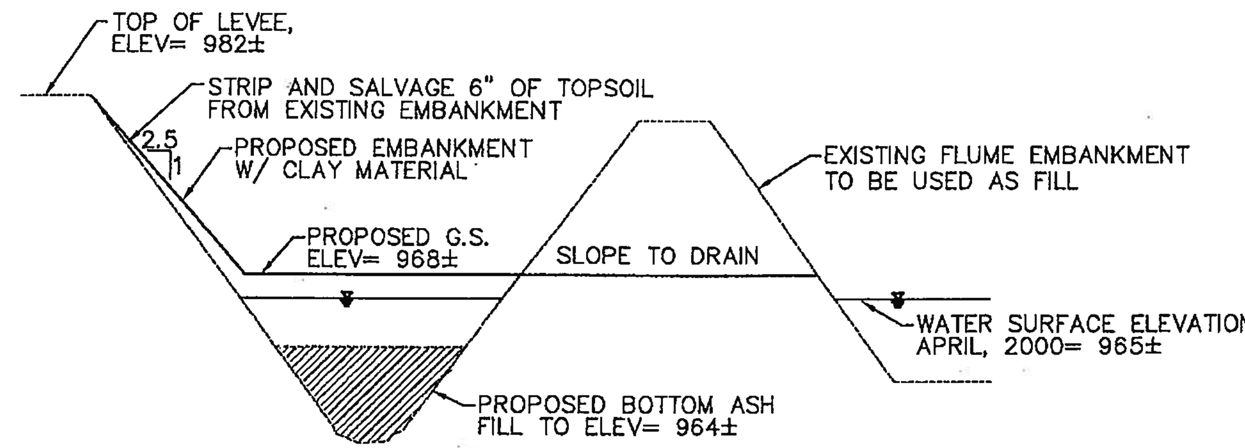
project RETURN FLUME RECONSTRUCTION AND LEVEE REHABILITATION
client MIDAMERICAN ENERGY
sheet TITLE SHEET

project no. 10929
sheet A.01

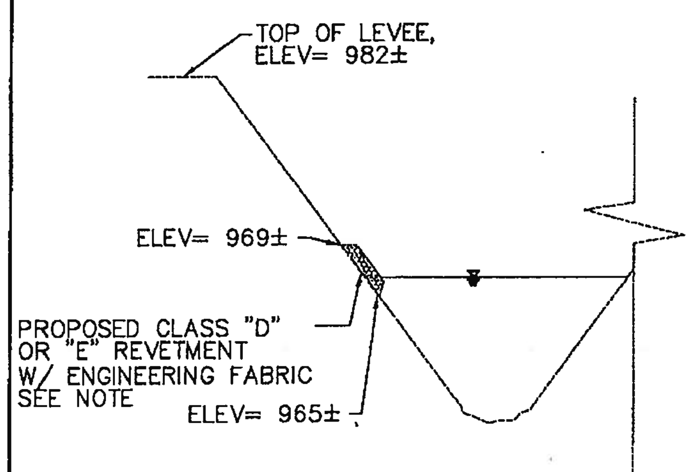
MAY '2000 fbc hgm.10929 T:\SDSKPROJ\10929\DWG\A01-COV



PROPOSED RETURN FLUME SECTION
(NOT TO SCALE)

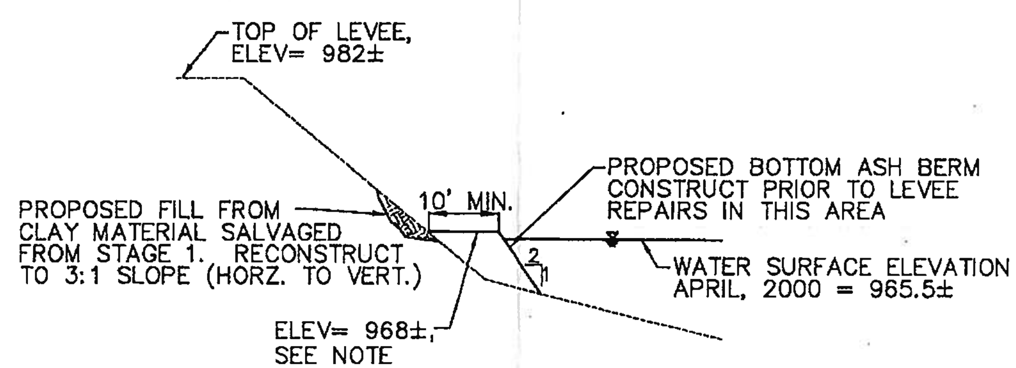


TYPICAL LEVEE SECTION
STA 12+80 TO STA 23+00
(NOT TO SCALE)



TYPICAL LEVEE SECTION
STA 10+80 TO STA 12+30
(NOT TO SCALE)

NOTE:
THE EMBANKMENT SHALL BE RECONSTRUCTED TO ITS ORIGINAL LINE AND GRADE PRIOR TO PLACEMENT OF THE REVETMENT.



TYPICAL LEVEE SECTION
STA 23+00 TO STA 34+35
(NOT TO SCALE)

NOTE:
THE BERM SHALL BE CONSTRUCTED TO A HEIGHT OF APPROXIMATELY 2' ABOVE THE EXISTING WATER SURFACE ELEVATION AT THE TIME OF CONSTRUCTION WITH A MINIMUM ELEVATION OF 968.

GENERAL NOTES:

1. THE SLOPES OF THE EXISTING EMBANKMENTS SHALL BE CUT INTO STEPS AS THE CONSTRUCTION OF THE NEW INBANKMENT PROGRESSES. EACH STEP SHALL BE CUT TO APPROXIMATE HORIZONTAL PLANES WHICH HAVE VERTICAL SLOPE DIMENSIONS OF NOT LESS THAN 3 FEET.
2. EMBANKMENT FILL SHALL BE DEPOSITED IN HORIZONTAL LAYERS NOT OVER 8" IN LOOSE THICKNESS.
3. ANY BORROW SOILS FOUND TO CONTAIN MATERIALS THAT ARE ORGANIC SHALL NOT BE USED AS FILL FOR THE LITTLE PONY CREEK LEVEE. THESE MATERIALS IF ENCOUNTERED, MAY BE USED AS FILL FOR THE EXISTING RETURN FLUME.

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project RETURN FLUME RECONSTRUCTION AND LEVEE REHABILITATION
client MIDAMERICAN ENERGY
sheet TYPICAL SECTIONS

project no. 10929
sheet B.01

GENERAL NOTES

1. THE UTILITIES SHOWN ARE FROM LOCATES OR DRAWINGS PROVIDED TO THE ENGINEER BY UTILITIES COMPANIES. THE ENGINEER MAKES NO GUARANTEE THAT THE UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE ENGINEER FURTHER DOES NOT WARRANT THAT THE UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED.

   THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES (PUBLIC AND PRIVATE) AT LEAST 48 HOURS IN ADVANCE OF THE ACTUAL STARTING DATE OF CONSTRUCTION. THE CONTRACTOR IS TO DETERMINE ACTUAL LOCATIONS OF UTILITIES IN THE FIELD. THE CONTRACTOR IS TO USE DUE CAUTION IN WORKING OVER AND AROUND ALL UTILITY LINES. BREAKS IN THE UTILITY LINES DUE TO THE CONTRACTOR ARE TO BE REPAIRED OR REPLACED WITHOUT COST TO THE OWNER OR ENGINEER.

   OTHER EXISTING UNDERGROUND INSTALLATIONS AND STRUCTURES ARE INDICATED ON THE DRAWINGS ACCORDING TO THE INFORMATION FURNISHED TO THE ENGINEER BY OTHERS. THE ENGINEER DOES NOT GUARANTEE THE ACCURACY OF SUCH INFORMATION. THE CONTRACTOR SHALL MAKE EVERY EFFORT TO LOCATE ALL EXISTING UNDERGROUND INSTALLATIONS AND STRUCTURES IN THE VICINITY OF THE WORK TO BE DONE BY PROSPECTING IN ADVANCE OF EXCAVATIONS.

   FOR YOUR INFORMATION THE FOLLOWING TELEPHONE NUMBER CAN BE USED WHEN REQUESTING LOCATIONS FOR UTILITIES THAT ARE MEMBERS OF THE IOWA ONE CALL SYSTEM: 1-800-292-8989.

2. CONTRACTOR SHALL PROVIDE MIDAMERICAN ENERGY WITH THE NAME AND PHONE NUMBER OF THEIR REPRESENTATIVE TO BE CONTACTED DURING WORKING AND NONWORKING HOURS AS NECESSARY.

3. A QUALIFIED SUPERINTENDENT, WHO IS ACCEPTABLE TO THE OWNER, SHALL BE MAINTAINED ON THE WORK AND GIVE EFFICIENT SUPERVISION TO THE WORK UNTIL ITS COMPLETION. THE SUPERINTENDENT SHALL HAVE FULL AUTHORITY TO ACT IN BEHALF OF THE CONTRACTOR, AND ALL DIRECTIONS GIVEN TO THE SUPERINTENDENT SHALL BE CONSIDERED GIVEN TO THE CONTRACTOR. IN GENERAL, THE SUPERINTENDENT SHALL NOT BE ENGAGED IN THE FULL-TIME OPERATION OF EQUIPMENT /MACHINERY ON THE WORK.

4. THE CONTRACTOR SHALL TAKE STEPS TO CONTROL SOIL EROSION DURING CONSTRUCTION. IF NECESSARY, HAY BALES, CHECK DAMS, OR SILT FENCE SHALL BE USED TO RETAIN SILT AND PREVENT SILT FROM ENTERING THE FLUME. THIS WORK SHALL BE CONSIDERED INCIDENTAL TO THE PROJECT.

5. PRIOR TO COMMENCING ANY WORK, THE CONTRACTOR SHALL DEVELOP A CONSTRUCTION STAGING PLAN AND PROPOSED SCHEDULE IN COOPERATION WITH A REPRESENTATIVE OF MIDAMERICAN ENERGY AND THE ENGINEER.

6. ALL AREAS OF THE LITTLE PONY CREEK LEVEE DISTURBED BY THE CONTRACTOR DURING CONSTRUCTION SHALL BE REESTABLISHED TO THEIR PRE CONSTRUCTION CONDITION, AT THE EXPENSE OF THE CONTRACTOR PRIOR TO FINAL ACCEPTANCE OF THE PROJECT. A PROFILE OF THE CROWN OF THE LEVEE WILL BE TAKEN PRIOR TO THE START OF CONSTRUCTION AND UPON COMPLETION OF THE CONSTRUCTION, PRIOR TO FINAL ACCEPTANCE.

7. PARTIAL PAY ESTIMATES FOR EARTHWORK WILL BE DETERMINED BY METHODS AGREED UPON BETWEEN THE OWNER AND THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION.

HORIZONTAL AND VERTICAL CONTROL

TEMPORARY BENCH MARK #1: ELEV. = 979.35
T-BAR UNDER TOWER 6'± SOUTH EAST OF NORTH WEST LEG
N: 4404.12 E: 4473.19

TEMPORARY BENCH MARK #2: ELEV. = 980.50
T-BAR WEST EDGE OF FAR EAST LEVEE ALONG I-29 NEAR FIRST POWER POLES SOUTH OF CREEK
N: 4970.44 E: 6769.51

LEGEND

	CORPORATE LINE
	SECTION LINE
	CENTER LINE
	FLOW LINE
	CURB STOP (RESIDENTIAL WATER)
	EXISTING PIPE PLUG
	FENCE
	FIRE HYDRANT
	INLET-BEEHIVE
	INLET-CURB
	INLET-GRATE
	INLET-COMBINATION
	INLET-TYPE A
	MAILBOX
MHO	MANHOLE
	PAVEMENT AND SIDEWALK REMOVAL
	POWER POLE
	POWER POLE W/ GUY WIRE
	POWER AND LIGHT POLE
	POWER POLE W/ TRANSFORMER
	TELEPHONE POLE
	GUY POLE
	GUY WIRE
	STREET SIGN
	RAILROAD SIGNAL
	LIGHT POLE
	YARD LIGHT
	TRAFFIC SIGNAL
	ELECTRICAL TRANSFORMER
	POST ROUND
	POST SQUARE
CATV	CABLE TELEVISION BOX
SH	SPRINKLER HEAD
	RETAINING WALL
	RETAINING WALL
	TELEPHONE TERMINAL BOX
E	OVERHEAD ELECTRIC CABLE
UEC	UNDERGROUND ELECTRIC CABLE
T	OVERHEAD TELEPHONE CABLE
UGT	UNDERGROUND TELEPHONE CABLE
G	GAS METER
G	VALVE - GAS
GVT	GAS VENT
	VALVE - WATER (MAIN LINE)
W	WATER MAIN
G	GAS MAIN
W	WATER METER
	WELL
	RAILROAD TRACK
	RAILROAD TRACK
	TRAFFIC SIGNAL POLE
TCB	TRAFFIC CONTROL BOX
	TEST HOLE
BOC	BACK OF CURB
POB	POINT OF BEGINNING
BM	BENCH MARK
	FOUND IRON PIN
	SET PIN
	FOUND SECTION CORNER
MN	MAZE NAIL
	FOUND CONCRETE MONUMENT
EOR	END OF RETURN
COMB. SEW	COMBINATION SEWER
SAN	SANITARY SEWER
STM	STORM SEWER
UAC	USE AS CONSTRUCTED
12"	BUSH
	HEDGE
12"	DECIDUOUS TREE W/ DIAMETER
12"	EVERGREEN TREE W/ DIAMETER
12"	TREE REMOVAL
6" ST	STUMP W/ DIAMETER
6" ST	STUMP REMOVAL
C	CONTRACTION
E	EXPANSION
KD	KEY AND DOWEL
L	LONGITUDINAL
TE	THICKENED EDGE
80	INTERSTATE
71	U.S. HIGHWAY
192	IOWA HIGHWAY
K39	COUNTY HIGHWAY

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DDI drawn
DAB designed
PMK approved
MAY '00 date

project RETURN FLUME RECONSTRUCTION AND LEVEE REHABILITATION
client MIDAMERICAN ENERGY
sheet GENERAL NOTES & LEGEND

project no. 10929
sheet C.01

MAY 00 hgm 10929

ESTIMATED QUANTITIES

LINE NO.	DESCRIPTION	ESTIMATED QUANTITIES	UNIT	REC. QUAN.
	DIVISION I: RETURN FLUME RELOCATION AND			
	LEVEE RECONSTRUCTION TO STATION 23+00			
1	Strip and Salvage Topsoil	820.00	C.Y.	
2	Embankment in Place – Bottom Ash Material	5,350.00	C.Y.	
3	Embankment in Place – General Fill	28,890.00	C.Y.	
4	Channel Excavation	6,000.00	C.Y.	
5	Fly Ash for Drying	100.00	TON	
6	60" Diameter C.M.P., 10 Gage,			
	Annular Corrugations	156.00	L.F.	
7	60" Metal Aprons	4.00	EA.	
8	Revetment, Class "D" or "E"	165.00	TON	
9	Engineering Fabric	272.00	S.Y.	
10	Respread Topsoil	1.00	L.S.	
11	Seeding, Fertilizing, and Mulching	1.30	AC.	
	DIVISION II: WAVE DISSIPATION BERM AND			
	LEVEE REHABILITATION, STATION 23+00			
	TO STATION 34+00			
1	Strip and Salvage Topsoil	120	C.Y.	
2	Embankment in Place – Bottom Ash Material	5,148.00	C.Y.	
3	Embankment in place – General Fill	878.00	C.Y.	
4	Seeding, Fertilizing, and Mulching	0.25	AC.	

ESTIMATE REFERENCE INFORMATION

DIVISION I: RETURN FLUME RELOCATION AND LEVEE RECONSTRUCTION TO STATION 23+00.

1. BID ITEM INCLUDES THE REMOVAL OF THE ORGANIC MATERIAL TO A MINIMUM DEPTH OF 6" FROM THE LITTLE PONY CREEK LEVEE, PRIOR TO THE PLACEMENT OF EMBANKMENT FILL. IN ADDITION, THE ITEM INCLUDES STRIPPING OF MATERIAL FROM THE RETURN FLUME EMBANKMENT TO PROVIDE ENOUGH TOPSOIL MATERIAL TO PLACE A 6" (UNCOMPACTED DEPTH) LAYER OF TOPSOIL PRIOR TO SEEDING THE AREAS SHOWN ON SHEET D.01. STORAGE OF THE MATERIAL WILL BE ALLOWED ON SITE IN A LOCATION APPROVED BY THE OWNER IN CLOSE PROXIMITY TO THE CONSTRUCTION AREA. STORAGE OF THE STOCKPILED TOPSOIL MATERIAL IN THE LITTLE PONY CREEK FLOODPLAIN WILL NOT BE ALLOWED.

   MEASUREMENT FOR PAYMENT OF THIS BID ITEM SHALL BE BASED ON THE PLAN QUANTITY AS ESTIMATED BY THE ENGINEER. IF IT IS DETERMINED THAT ADDITIONAL TOPSOIL IS REQUIRED TO ESTABLISH SEEDING IN OTHER AREAS OF THE PROJECT, ADDITIONAL PAYMENT SHALL BE MADE AT THE CONTRACT PRICE PER CUBIC YARD.

2. THE MATERIAL FOR THIS BID ITEM IS STOCKPILED IN THE AREA SHOWN ON SHEET D.01. THE AREA OF STOCKPILED MATERIAL EXTENDS SOUTH OF THE AREA SHOWN ON THE PLANS. BECAUSE OF THE ANTICIPATED GROUNDWATER LEVEL AND WATER SURFACE ELEVATION OF THE ASH POND, IT IS ASSUMED FOR THIS PROJECT THAT THE MATERIAL WILL BE REMOVED TO AN ELEVATION OF 988.0 (+/–). THE CONTRACTOR MAY REMOVE MATERIAL BELOW THE WATER TABLE AS FILL FOR THE EMBANKMENT, WITH THE APPROVAL OF THE OWNER. NO ADDITIONAL PAYMENT WILL PER UNIT BE MADE SUCH FOR WORK, EXCEPT IN THE AREA DESIGNATED AS CHANNEL EXCAVATION.

   PAYMENT FOR THIS BID ITEM SHALL BE BASED ON PLAN QUANTITY AS ESTIMATED BY THE ENIGINEER, AND SHALL BE FULL COMPENSATION FOR THE PLACEMENT OF THE MATERIAL TO THE LINES AND GRADES AS INDICATED IN THESE DOCUMENTS. THE MATERIAL IS A GRANULAR MATERIAL, AND THE ENGINEER'S ESTIMATE ASSUMES A SHRINKAGE FACTOR OF 10%.

3. THE MATERIAL FOR THIS BID ITEM SHALL BE OBTAINED FROM THE EXISTING RETURN FLUME EMBANKMENT OR FROM OTHER AREAS AVAILABLE ON SITE. NO EMBANKMENT MATERIAL FROM OFF SITE WILL BE REQUIRED FOR THIS PROJECT.

   PAYMENT FOR THIS BID ITEM SHALL BE BASED ON PLAN QUANTITY AS ESTIMATED BY THE ENGINEER, AND SHALL BE FULL COMPENSATION FOR THE PLACEMENT OF THE MATERIAL. SHRINK IS ESTIMATED AT 35%. TYPE "A" COMPACTION IS REQUIRED.

   THE CONTRACTOR SHALL STOCKPILE APPROXIMATELY 1000 C.Y. OF FILL MATERIAL UNDER THIS BID ITEM FOR USE AS LEVEE REPAIR MATERIAL IN DIVISION II. THE COST FOR STOCKPILING MATERIAL IS CONSIDERED INCIDENTIAL.

ESTIMATE REFERENCE INFORMATION

4. PAYMENT FOR THIS BID ITEM SHALL BE MADE FOR THE QUANTITY OF MATERIAL REQUIRED TO EXCAVATE THE PROPOSED RETURN FLUME CHANNEL, AS SHOWN ON SHEET D.01. PAYMENT WILL NOT BE MADE UNDER THIS BID ITEM FOR THE EXCAVATION OF THE EXISTING FLUME EMBANKMENT THAT IS REQURED DURING THE CONSTRUCTION OF THE PROPOSED RETURN FLUME CHANNEL.

   THE EXCAVATED MATERIAL SHALL BE USED IN THE CONSTRUCTION OF THE PROPOSED RETURN FLUME EMBANKMENT. THE COST FOR USING THIS MATERIAL FOR EMBANKMENT IS INCLUDED IN BID ITEM NUMBER 3.

2–4. THE FOLLOWING INFORMATION IS PROVIDED TO IDENTIFY THE ENGINEER'S METHOD OF ESTIMATING THESE BID ITEMS:

   THIS INFORMATION IS PROVIDED FOR REFERENCE ONLY, AND SHALL NOT BE USED AS A BASIS FOR ADDITIONAL PAYMENT.

   SUMMARY OF EARTHWORK QUANTITIES:

   2. EMBANKMENT IN PLACE – BOTTOM ASH MATERIAL

FILL	4,864 C.Y.
SHRINKAGE (10%)	486 C.Y.
TOTAL	5,350 C.Y.

   3. EMBANKMENT IN PLACE – GENERAL FILL

FILL	21,400 C.Y.
SHRINKAGE (35%)	7,490 C.Y.
TOTAL	28,890 C.Y.

   4. CHANNEL EXCAVATION

CUT	6,000 C.Y.
TOTAL	6,000 C.Y.

5. THIS ITEM IS TO BE USED TO AID IN THE DRYING OF THE EXISTING FLUME DURING CONSTRUCTION. THE ITEM SHALL ONLY BE USED IF DEEMED NECESSARY BY THE ENGINEER AT AN APPLICATION RATE TO BE DETERMINED DURING CONSTRUCTION.

   PAYMENT FOR THIS ITEM SHALL BE BASED ON SCALE TICKETS PROVIDED TO THE OWNER (OR THE OWNER'S ON SITE REPRESENTATIVE). SCALE TICKETS NOT PROVIDED WITHIN 48 HOURS SHALL NOT BE CONSIDERED FOR PAYMENT.

6. INCLUDES COST OF FURNISHING AND INSTALLING 60 INCH DIAMETER CORRUGATED METAL PIPE AND BEDDING MATERIAL REQUIRED. MEASUREMENT SHALL BE BY LINEAL FOOTAGE ALONG THE PIPE FROM APRON TO APRON. REFER TO DETAIL SHEET B.02 FOR ADDITIONAL INFORMATION.

7. INCLUDES COST OF FURNISHING AND INSTALLING 60 INCH DIAMETER APRON. REFER TO DETAIL SHEET B.02 FOR ADDITIONAL INFORMATION.

8. THE UNIT PRICE BID FOR THIS ITEM SHALL BE FULL COMPENSATION FOR FURNISHING AND INSTALLING REVETMENT, CLASS D OR E, TO THE LINES AND GRADES AS INDICATED IN THESE DOCUMENTS. REVETMENT SHALL MEET THE REQUIREMENTS OF ARTICLE 2507 OF IDOT STANDARD SPECIFICATIONS, SERIES 1997.

   PAYMENT FOR THIS ITEM SHALL BE BASED ON SCALE TICKETS PROVIDED TO THE OWNER (OR THE OWNER'S ON SITE REPRESENTATIVE). SCALE TICKETS NOT PROVIDED WITHIN 48 HOURS SHALL NOT BE CONSIDERED FOR PAYMENT.

9. MEASUREMENT FOR PAYMENT OF THIS BID ITEM SHALL BE BY THE SQUARE YARD AT THE CONTRACT UNIT PRICE. ENGINEERING FABRIC SHALL BE PLACED UNDER THE REVETMENT IN THE AREA SHOWN ON SHEET D.01.

10. THE LUMP SUM PRICE BID FOR THIS ITEM SHALL BE FULL COMPENSATION TO SPREAD TOPSOIL AT A LOOSE DEPTH OF 6", AND TO PROVIDE SUITABLE COMPACTION OF THE TOPSOIL PRIOR TO SEEDING IN THE AREAS SHOWN ON SHEET D.01.

11. ALL AREAS DISTURBED DURING THE CONSTRUCTION SHALL BE SEEDED ACCORDING TO ARTICLE 2601 OF THE IDOT STANDARD SPECIFICATIONS, SERIES 1997. MEASUREMENT FOR PAYMENT SHALL BE BASED ON FIELD MEASURED AREAS IN ACRES AT THE CONTRACT UNIT PRICE.

ESTIMATE REFERENCE INFORMATION

DIVISION II: WAVE DISSIPATION BERM AND LEVEE REHABLILITATION, STATION 23+00 TO STATION 34+00

1. BID ITEM INCLUDES THE REMOVAL OF THE ORGANIC MATERIAL TO A MINIMUM DEPTH OF 6" FROM THE LITTLE PONY CREEK LEVEE, PRIOR TO THE PLACEMENT OF EMBANKMENT FILL. IN ADDITION, THE ITEM INCLUDES STRIPPING OF MATERIAL FROM THE RETURN FLUME EMBANKMENT TO PROVIDE ENOUGH TOPSOIL MATERIAL TO PLACE A 6" (UNCOMPACTED DEPTH) LAYER OF TOPSOIL PRIOR TO SEEDING THE AREAS SHOWN ON SHEET D.02. STORAGE OF THE MATERIAL WILL BE ALLOWED ON SITE IN A LOCATION APPROVED BY THE OWNER IN CLOSE PROXIMITY TO THE CONSTRUCTION AREA. STORAGE OF THE STOCKPILED TOPSOIL MATERIAL IN THE LITTLE PONY CREEK FLOODPLAIN WILL NOT BE ALLOWED.

   MEASUREMENT FOR PAYMENT OF THIS BID ITEM SHALL BE BASED ON THE PLAN QUANTITY AS ESTIMATED BY THE ENGINEER. IF IT IS DETERMINED THAT ADDITIONAL TOPSOIL IS REQUIRED TO ESTABLISH SEEDING IN OTHER AREAS OF THE PROJECT, ADDITIONAL PAYMENT SHALL BE MADE AT THE CONTRACT PRICE PER CUBIC YARD.

2. THE MATERIAL FOR THIS BID ITEM IS STOCKPILED IN THE AREA SHOWN ON SHEET D.01. THE AREA OF STOCKPILED MATERIAL EXTENDS SOUTH OF THE AREA SHOWN ON THE PLANS. BECAUSE OF THE ANTICIPATED GROUNDWATER LEVEL AND WATER SURFACE ELEVATION OF THE ASH POND, IT IS ASSUMED FOR THIS PROJECT THAT THE MATERIAL WILL BE REMOVED TO AN ELEVATION OF 988.0 (+/–). THE CONTRACTOR MAY REMOVE MATERIAL BELOW THE WATER TABLE AS FILL FOR THE EMBANKMENT, WITH THE APPROVAL OF THE OWNER. NO ADDITIONAL PAYMENT WILL BE MADE FOR SUCH WORK.

   PAYMENT FOR THIS BID ITEM SHALL BE BASED ON PLAN QUANTITY AS ESTIMATED BY THE ENIGINEER, AND SHALL BE FULL COMPENSATION FOR THE PLACEMENT OF THE MATERIAL TO THE LINES AND GRADES AS INDICATED IN THESE DOCUMENTS. THE MATERIAL IS A GRANULAR MATERIAL, AND THE ENGINEER'S ESTIMATE ASSUMES A SHRINKAGE FACTOR OF 10%.

3. THE MATERIAL FOR THIS BID ITEM SHALL BE OBTAINED FROM STOCKPILED MATERIAL FROM DIVISION I. NO EMBANKMENT MATERIAL FROM OFF SITE WILL BE REQUIRED FOR THIS PROJECT.

   PAYMENT FOR THIS BID ITEM SHALL BE BASED ON PLAN QUANTITY AS ESTIMATED BY THE ENGINEER, AND SHALL BE FULL COMPENSATION FOR THE PLACEMENT OF THE MATERIAL. SHRINK IS ESTIMATED AT 35%. TYPE "A" COMPACTION IS REQUIRED.

2–3. THE FOLLOWING INFORMATION IS PROVIDED TO IDENTIFY THE ENGINEER'S METHOD OF ESTIMATING THESE BID ITEMS:

   THIS INFORMATION IS PROVIDED FOR REFERENCE ONLY, AND SHALL NOT BE USED AS A BASIS FOR ADDITIONAL PAYMENT.

   SUMMARY OF EARTHWORK QUANTITIES:

   2. EMBANKMENT IN PLACE – BOTTOM ASH MATERIAL

FILL	4,680 C.Y.
SHRINKAGE (10%)	468 C.Y.
TOTAL	5,148 C.Y.

   3. EMBANKMENT IN PLACE – GENERAL FILL

FILL	650 C.Y.
SHRINKAGE (35%)	228 C.Y.
TOTAL	878 C.Y.

4. ALL AREAS DISTURBED DURING THE CONSTRUCTION SHALL BE SEEDED ACCORDING TO ARTICLE 2601 OF THE IDOT STANDARD SPECIFICATIONS, SERIES 1997. MEASUREMENT FOR PAYMENT SHALL BE BASED ON FIELD MEASURED AREAS IN ACRES AT THE CONTRACT UNIT PRICE.

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council bluffs omaha

DDI drawn
DAB designed
PMK approved
MAY '00 date
revision date

project RETURN FLUME RECONSTRUCTION AND LEVEE REHABILITATION
client MIDAMERICAN ENERGY
sheet ESTIMATED QUANTITIES AND EST. REF. INFOR.

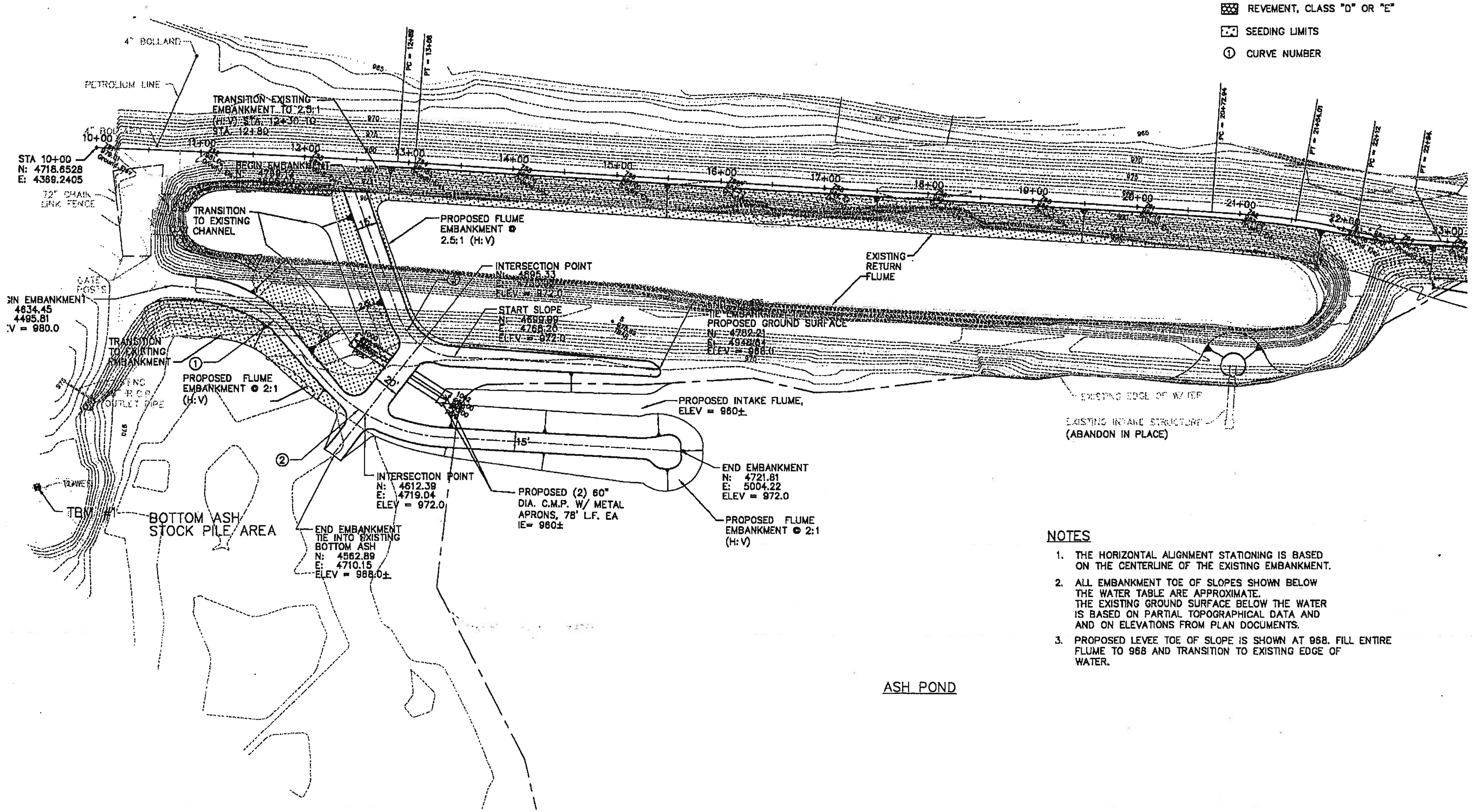
project no. 10929
sheet C.02

CURVE DATA

CURVE NO.	PC	PT	RADIUS POINT	RADIUS (FT)
1.	N: 4645.58 E: 4523.27	N: 4645.59 E: 4613.41	N: 4534.37 E: 4568.35	120
2.	N: 4621.15 E: 4666.35	N: 4626.91 E: 4795.93	N: 4776.15 E: 4727.93	164
3.	N: 4710.37 E: 4702.77	N: 4699.99 E: 4768.20	N: 4754.59 E: 4743.32	60

LEGEND

- REVEMENT, CLASS "D" OR "E"
- SEEDING LIMITS
- ① CURVE NUMBER



NOTES

1. THE HORIZONTAL ALIGNMENT STATIONING IS BASED ON THE CENTERLINE OF THE EXISTING EMBANKMENT.
2. ALL EMBANKMENT TOE OF SLOPES SHOWN BELOW THE WATER TABLE ARE APPROXIMATE. THE EXISTING GROUND SURFACE BELOW THE WATER IS BASED ON PARTIAL TOPOGRAPHICAL DATA AND AND ON ELEVATIONS FROM PLAN DOCUMENTS.
3. PROPOSED LEVEE TOE OF SLOPE IS SHOWN AT 968. FILL ENTIRE FLUME TO 968 AND TRANSITION TO EXISTING EDGE OF WATER.

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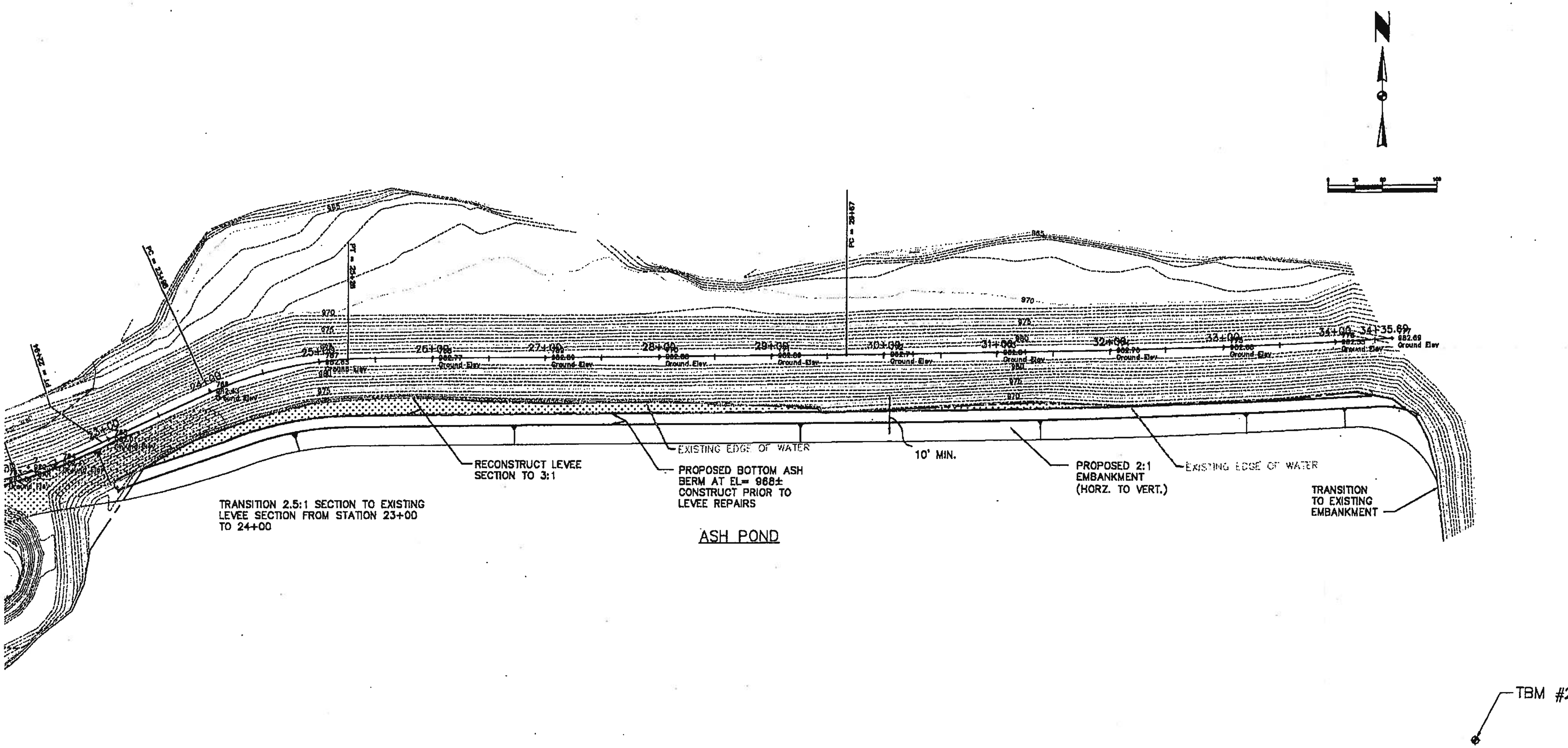
drawn: DDI
designed: JET
approved: PMK
date: MAY '00

project: RETURN FLUME RECONSTRUCTION AND LEVEE REHABILITATION
client: MIDAMERICAN ENERGY
sheet: PLAN SHEET - STAGE 1

project no. 10929
sheet D.01



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DDJ drawn
JFT designed
PMK approved
MAY '00 date

project RETURN FLUME RECONSTRUCTION AND LEVEE REHABILITATION
client MIDAMERICAN ENERGY
sheet PLAN SHEET - STAGE 2

project no. 10929
sheet D.02

APPENDIX E

LEAST TERN AND PIPING PLOVER CONSERVATION MANAGEMENT PLAN

MidAmerican
ENERGY
OBSESSIVELY, RELENTLESSLY AT YOUR SERVICE®

LEAST TERN AND PIPING PLOVER CONSERVATION MANAGEMENT PLAN

MIDAMERICAN ENERGY COMPANY
WALTER SCOTT, JR. ENERGY CENTER
7215 NAVAJO STREET
COUNCIL BLUFFS, IA 51501

APRIL 2010

History

In 1986, the interior population of the least tern (*Sternula antillarum athalassos*) was listed as an endangered species, and the Great Plains piping plover (*Charadrius melodus*) was listed as a threatened species under the federal Endangered Species Act of 1973. Currently, the only known breeding locations of the least tern and piping plover in Iowa occur at artificially-created ash disposal areas located at the MidAmerican Energy Company's (MEC's) Walter Scott Jr. Energy Center (WSEC) in Pottawattamie County, Iowa, and Neal Energy Center in Woodbury County, Iowa.

In 1983, piping plovers were identified nesting at the north and south surface impoundment areas at WSEC and have been found nesting in 20 of the 22 years evaluated from 1983 through 2004. Nesting has been documented by observed active nests or young. Piping plovers were also identified nesting in these areas in 2007 through 2009.

Least terns were found nesting at the WSEC surface impoundments in 1984 and have been found nesting (as evidenced by active nests or young observed) in 15 of the 21 years evaluated from 1984 to 2004. Least terns were also identified nesting in these areas in 2007 through 2009.

Persistent nesting of these species at the north and south surface impoundment areas indicates that the management at these sites has both incidentally (management for facility productivity such as vegetation control and maintenance of sluice lines) and intentionally (management for habitat improvement by creation of an undulating topography in the ash ponds) produced habitat that is attractive to both species for nesting. These north and south surface impoundment areas have become consistent breeding areas for piping plovers and least terns most likely because they are one of the few habitats in Iowa that resemble the riparian sandbars that were once common on the Missouri River.

Least Terns

Least terns are colony nesters, primarily using bare or sparsely vegetated sand or dried mudflats along rivers, sandy or shell islands, and gravel and sand pits. Nest initiation dates for the least tern range from mid-May to mid-July. The nest consists of a shallow scrape in the sand in which the female lays one to three eggs. Incubation ranges from 17 to 28 days, with both adults sharing incubation duties. When an intruder enters the nesting area, the terns respond by circling overhead, calling, defecating, and diving at the intruder.

Chicks are able to walk almost immediately after hatching, but they generally remain in or near the nest for approximately two days. After two days, the chicks become more mobile and will move away from the nest. When chicks are disturbed or threatened, they typically respond by remaining motionless on the ground; their cryptic coloration makes them nearly invisible in the sand. Chicks are independent of adults and able to fly at about 20 days of age.

Piping Plovers

The nesting season for the piping plover population ranges from late-April through August, with most nests initiated in May and June. The female lays her eggs in a shallow scrape often lined with shells or small pebbles. Plovers lay three to five eggs and incubation lasts 22 to 31 days. Both males and females share incubation duties. Peak hatch in the Great Plains occurs in the first two weeks of June, although chicks can hatch both before and after this period, dependent on seasonal variables. Piping plover chicks leave the nest soon after hatching. The parents continue to brood the chicks up to 28 days after hatching, and chicks are considered able to fly from 28 to 35 days after hatching.

Purpose of the Management Plan

This management plan provides a detailed list of operational activities that can be performed at Walter Scott Jr. Energy Center while protecting the nesting least terns and piping plovers during the breeding seasons.

Need for the Management Plan

On May 21, 2009, U.S. Fish and Wildlife Service (USFWS) staff visited WSEC due to an anonymous tip that WSEC staff was harming piping plovers and least terns. USFWS recommended that activities at the north and south surface impoundments and Iowa Department of Transportation (IDOT) borrow site cease until a ground nesting survey be performed. A ground nesting survey completed by Tetra Tech revealed several nesting locations for both least terns and piping plovers at the north and south surface impoundments. Upon a follow-up site visit on July 22, 2009 and review of the survey, USFWS recommended the development and implementation of a management plan for the facility.

The management plan is a necessary tool to provide guidance to Walter Scott Jr. Energy Center that allows least terns and piping plovers to nest at the north and south surface impoundment areas while the facility completes both routine and non-routine activities without negatively impacting the two listed species. Routine activities include grading the surface of the surface impoundments to maintain ideal operating conditions and dredging the ash sluice line discharge channel at the south surface impoundment to maintain proper flow. Non-routine activities are those that occur with irregular frequency, such as conducting line-locates prior to any digging activity near the surface impoundments.

Land Management Strategies

The conservation management plan for WSEC entails land management strategies for the north and south surface impoundments as well as an educational program for facility staff and contractors that may perform work activities in the areas where least terns and piping plovers nest and forage during the nesting season. A detailed site plan located in Appendix A identifies areas called out in this plan.

1. Least tern and piping plover education

WSEC staff will be required annually to complete a computer-based training program or participate in a town-hall meeting that details the facility tern and plover conservation management plan. The training will focus on the following:

- Identification of both species from egg to adult, with emphasis on distinguishing young Killdeer from Piping Plovers.
- Dates when both species are present.
- Activities that can be completed during the nesting and non-nesting seasons.

In addition to WSEC staff, contractors, vendors, and other pertinent people will be required to complete the training.

2. Nesting season for the least terns and piping plovers

The U.S. Fish and Wildlife Service has recommended using a nesting period of April 1 to August 15 for both least terns and piping plovers.

3. Ground nesting and point count surveys

At the onset of the nesting season, a survey shall be performed by MEC personnel to identify nesting locations of both species. A two-person crew will identify potential breeding pairs by observing terns and plovers from a distance with binoculars, looking for breeding behaviors. Once potential pairs are identified, the crew will watch the birds to determine if they have constructed a nest. After a nest is initiated, one person will slowly walk to the nesting area to confirm the presence of a nest and will record the nest using a global positioning system (GPS) receiver. The other crew member will act as a spotter and help guide the other person to the nest. The ground nesting survey will be used to create boundary limits for operational activities at the surface impoundments.

Random point-count surveys will be conducted during the nesting season when critical maintenance activities must be completed at the surface impoundments in order to alleviate potential conflicts. The purpose of a point count survey is to determine if a proposed work in a particular area will impact least terns and piping plovers. Critical maintenance activities included dredging the ash sluice discharge channel in the south surface impoundment so that water does not overtop the channel and disturb the identified ideal breeding and nesting habitat. Refer to "Piping Plover and Least Tern Identification and Survey Procedures" in Appendix B for greater detail on the survey procedures.

Ground nesting and point count surveys will be conducted periodically beginning in late April through mid-July. The frequency of these surveys will depend on weather conditions, plant operating conditions, and results of previous surveys throughout the season. During these surveys, crew members will take note of any banded terns and plovers, whether they were banded in the Missouri River or Platte River systems, and provide that information to USFWS.

4. South Surface Impoundment Habitat Improvements

The south surface impoundment encompasses an area approximately 133 acres in size. The south surface impoundment area includes shoreline, open areas, open water, and the south levee of Pony Creek. The north boundary of the south surface impoundment adjoins Pony Creek, the east boundary adjoins the right-of-way of Interstate Highway 29, the south boundary adjoins the right-of-way of 189th Street, and the west boundary adjoins the right-of-way of the Southwest Iowa Renewable Energy (SIRE) rail line.

- A vegetative buffer zone shall be designated east of the SIRE rail line. The vegetative buffer zone will discourage piping plovers and least terns from nesting and foraging in areas where critical facility activities occur. The buffer zone will be wide enough to allow operational activities to be completed west of the zone without impacting piping plovers and least terns.
  - Initially, the area designated as buffer zone will not be groomed so that vegetation grows. MEC may also seed the area designated as a buffer zone.
  - Over time, plant species may need to be introduced to the buffer area and unwanted species may need to be removed.
- An area east of the vegetative buffer zone will be designated as nesting and foraging habitat. This area shall be groomed prior to the nesting season so that it remains free of vegetation, encouraging both species to nest in this area. MEC will use a street maintainer blade to scrape the habitat area to remove vegetation and to make the shoreline as flat as possible.
- The shoreline around the south surface impoundment area shall remain untouched. Temporary traffic barriers and information signs will be put in place during the nesting season to restrict access and identify the impoundment as a conservation management area.

5. South Surface Impoundment Activities

Dredging of the Unit 3 ash sluice line discharge area can be performed without a survey from August 15 to March 31. If dredging activities are to be completed close to August 15 or March 31, it is at the discretion of MEC Environmental Services to determine if surveys will be required. Point count surveys must be completed prior to dredging activities from April 1 to August 15.

6. North Surface Impoundment Habitat Improvements

The north surface impoundment encompasses an area approximately 171 acres in size. The north surface impoundment area includes shoreline, open areas, open water, C-stone mining area and haul road, and the Units 1 and 2 ash sluice discharge area. The north boundary of the north surface impoundment adjoins the right-of-way of a private access road, the east boundary adjoins the right-of-way of Interstate Highway 29, the south boundary adjoins the right-of-way of a private access road, and the west boundary adjoins the right-of-way of the SIRE rail line.

- A vegetative buffer zone shall be constructed east of the haul road and C-stone mining area. The vegetative buffer zone will discourage piping plovers and least terns from nesting and foraging. The buffer zone will be wide enough to allow operational activities to be completed west of the zone without impacting piping plovers and least terns.
  - Initially, the area designated as buffer zone will not be groomed so that vegetation grows. MEC may also seed the area designated as a buffer zone.
  - Over time, plant species may need to be introduced to the buffer area and unwanted species may need to be removed.
- An area east of the vegetative buffer zone will be designated as nesting and foraging habitat. This area shall be groomed using a scraper prior to the nesting season so that it remains free of vegetation, encouraging both species to nest in this area. A scraper will also be used to create narrow strips of c-stone material to the north and west of the beneficial reuse material stockpile (see Appendix A) to replicate favored nesting ridges for least terns. The area east of the beneficial reuse material stockpile will be scraped with a street maintainer blade to remove all vegetation and create a broad, flat area ideal for nesting piping plovers.
- The shoreline around the south surface impoundment area shall remain untouched. Temporary traffic barriers and information signs will be put in place during the nesting season to restrict access and identify the impoundment as a conservation management area.

The beneficial reuse material stockpile will be maintained; however, no additional material shall be added. Long term, this material will be removed and hauled to the IDOT borrow pit located northwest of the surface impoundment area.

7. North Surface Impoundment Activities

C-stone can be mined and sold without the completion of a survey from August 15 through March 31. If C-stone activities are to be completed near August 15 or March 31, it is at the discretion of MEC Environmental Services to determine if surveys will be required. Point count surveys must be completed prior to C-stone activities from April 1 to August 15.

A long-term management plan includes mining of C-stone and transporting the material to a location away from the surface impoundments. This strategy will enable the facility to sell the material year round without impacting the surface impoundment areas during the nesting season.

Signs will be posted at each surface impoundment identifying the area as ideal habitat for least terns and piping plovers, stating that access to these areas is restricted between April 1 and August 15 each year, and directing personnel to contact MEC Environmental Services prior to seeking access.

8. Easements near the Surface Impoundments

Companies and governmental agencies, including but not limited to SIRE and the U.S. Army Corps of Engineers, that have easements at or adjacent to the surface impoundments must abide by this plan. Easements must include language that recognizes this plan and the federal Endangered Species Act.

Conclusion

The Walter Scott Jr. Energy Center Management Plan for least terns and piping plovers is not meant to be all inclusive, but instead shall be a living document. It is recommended that the plan be reviewed by WSEC staff and MEC Environmental Services in March 2010, July 2010, and September 2010 to determine if the strategies set forth in the inaugural plan are sufficient as well as make changes to address any plan deficiencies.

After 2010, this document will be reviewed semiannually and as operations at the facility change, so too will the management plan.

ECMS entries shall be created for this plan to remind staff of upcoming reviews.

APPENDIX A
FACILITY SITE PLAN

APPENDIX B
PIPING PLOVER AND LEAST TERN IDENTIFICATION AND SURVEY PROCEDURES

Piping Plover and Least Tern
Identification and Survey Procedures

Piping Plovers:


Chick


Chick


Male


Female


Eggs


In flight

Nesting Habitat: Single nesting areas, April thru August, 3-5 eggs. Shallow scrape sometimes lines with small pebbles. Peak hatch in the first 2 weeks of June. Chick are mobile immediately after hatching.
Foraging: Feed on insects. Can be seen walking in sparse to lightly vegetated areas looking for insects. Will also forage along shorelines for insects.
Colony Departure: Mid September
Link to bird call: http://www.allaboutbirds.org/guide/Piping_Plover/id

Least Terns:

 Chick	 Juvenile plumage	 Eggs
 Female accepting fish from a male	 Profile view	 In flight

Nesting Habitat: Colony nesters, May thru August, 3 eggs. Peak hatch, in late June. Chicks stay in nest for approx. 2 days.
Foraging: Prey on small fish by hovering and then diving into water source for prey.
Colony Departure: Mid September
Other notes: When an intruder enters the nesting area, adult terns circle overhead, calling, defecating, and vomiting on the intruder. Juveniles respond by playing dead and remaining motionless.
Link to bird call: http://www.allaboutbirds.org/guide/least_tern/id

Piping Plover and Least Tern
Identification and Survey Procedures

Procedures for Maintenance Activities at the South Ash Pond Sluice Line Discharge Area

1. Notify Environmental Services (ES) of the start date and time and proposed completion date and time prior to the survey and maintenance activities.
2. Review photos and notes prior to the field survey. Call ES if there are concerns prior to surveying the proposed work area.
3. While slowly walking the proposed work area, scan the ground approximately 4-5 feet ahead and look for nests and eggs.
   a. Nests are essentially scrapes in the surface and are often only three-eighths inch deep and a few inches in diameter.
   b. Eggs are round to oblong approximately one (1) inch in length.
   c. If a nest and/or nest with eggs are identified in the proposed work area, note the location of the nest and discontinue the survey.
4. After scanning 4-5 feet and clearing the area continue walking thru the proposed work area.
5. Take note of birds walking/foraging in the immediate area as well as birds in flight.
   a. If birds are walking/foraging outside of the proposed work area, note the distance from the proposed work area.
   b. If birds are located within the proposed work area, discontinue the survey and wait for the birds to move out of the proposed work area.
      i. Take note of the location of the birds.
      ii. Watch the birds and take note if they are near a nest.
      iii. Continue survey once birds have left the proposed work area.
6. Once the proposed work area has been walked down, place flags or lathe at the outer limits of the work area and begin activities.
   a. Utilize the smallest work area possible.
   b. Restrict activity to the work area.
      i. Machinery shall not perform work outside of the flagged area.
      ii. Waste material and machinery shall not be stored outside of the flagged area.
      iii. Waste material shall not be disposed of or spread outside of the storage area
   c. Keep the work activity to the smallest timeframe possible.
7. A spotter shall be used to watch the work area for birds and will immediately notify equipment operators to cease work.
8. Once the activities area complete, all equipment shall be removed from the work area.
9. Notify Environmental Service of completion date and time.
10. **At no time shall any person intentionally harass a bird. This includes yelling, shooing, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct.**

APPENDIX C
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